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ALASKA REVIEW OF SOCIAL AND ECONOMIC CONDITIONS

UNIVERSITY OF ALASKA, INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH, SEPTEMBER 1979, Vol. XVI, No. 1

VOCATIONAL EDUCATION IN ALASKA

CENTRAL ISSUES AND PROBLEM AREAS

INTRODUCTION

Vocational education in Alaska is expensive, and the state bears most of the cost. Over 25 million dollars was spent on vocational education during the 1978-79 fiscal year, of which 87 percent came from the state (see Tables 1 and 2).[1] Yet, despite these large public expenditures and despite a general public expectation that vocational education is somehow equipping people for available jobs in the local community or the state, Alaska's vocational education system as a whole is not organized to help students get jobs. Many training programs operate without adequate information on Alaska's labor market, offer few placement services, and do not develop relationships with prospective employers.

On the other hand, vocational education is also serving certain valuable functions for which it is not receiving credit. Many vocational programs in Alaska are teaching important practical skills, such as building construction, welding, and auto repair. These skills are highly relevant to Alaska life styles and community needs. Other programs are increasing the job competence of workers who are already employed. However, as worthwhile as these other vocational education goals may be, they are not

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[1] The federal share in vocational education will increase with the opening of the Alaska Federation of Natives' Job Corp Center in 1979. See Table 2.

This *Review* examines the total system of vocational education in Alaska in order to identify central problems and bring them to the attention of vocational educators, policymakers, and the general public whose taxes support most of these institutions.

This article looks first at the operation of Alaska's vocational education system, particularly at the postsecondary school level where vocational education is most directly concerned with occupational preparation. It identifies the institutions that provide vocational training, the numbers and types of vocational programs offered, and the characteristics of vocational education students. Second, it discusses five important problems in vocational education. These are:

1. Confusion about teaching job preparation versus practical skills as goals of vocational education.
2. Lack of information on the Alaska labor market.
3. Lack of attention to job placement and job development.
4. Low numbers of program graduates.
5. Lack of financial assistance for unemployed non-Native Alaskans in need of vocational training.

Finally, this study is intended to be a basic description, rather than an evaluation, of Alaska's vocational education system. Its purpose is to help identify areas in the system that need more intense evaluation and policy discussion.

See Table of Contents, page 2

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FEATURE

Judith Kleinfeld and Lynn Wright 1 Vocational Education in Alaska: Central Issues and Problem Areas

BOOK REVIEWS

Arthur E. Hippler 29 *Eskimos of Northwestern Alaska: a Biological Perspective,* edited by Paul L. Jamison, et. al.

30 *The Far North—2000 Years of American Eskimo and Indian Art,* by Henry B. Collins, et al.

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(Continued from Page 1)

publicly set forth as educational objectives, nor are they used as a central basis for systematic vocational planning and evaluation. It is job placement that is set forth as the official reason for the existence of vocational education, whereas these programs are actually fulfilling much more diverse and equally important functions.

Even though the present system can learn to better match its programs to the job market, the scarcity of jobs and resulting high unemployment in many Alaska communities limit the extent to which vocational education can realistically and effectively prepare students for jobs in these areas. Vocational education in Alaska, much more than in other regions of the country, must carefully determine what goals are realistic and how they can best be pursued.

How has this situation come about? It partly stems from the fact that vocational education problems and program needs have not received systematic attention, despite the substantial annual investment. Policymakers have not tended to view the system as a whole because it is fragmented and uncoordinated. Vocational education in Alaska is made up of many diverse institutions—individual community colleges, secondary schools, private schools, apprentice programs, and others—that operate in isolation from one another. As a result, policymakers have tended to look at individual institutions and have had little knowledge of what comprises the total vocational education system in Alaska and how the parts do or do not fit together. Major public policy decisions, such as whether or not to build an expensive new vocational education facility, have too often been based on inadequate information.

This study, supported by the Alaska Department

(Continued on Page 5)

Table 1

Vocational Education Expenditures by City and Borough School Districts and Rural Educational Attendance Areas: Audited School Operating Fund-Expenditures: FY 1977[a]

City and Local School Districts[b]	Vocational Education Instructional Units	Vocational Education Budget	Total School Budget	Proportion of Total Budget Spent on Vocational Education
Anchorage	100	$ 4,112,277	$ 82,782,708	5.0%
Bristol Bay	2	80,089	1,059,454	7.6
Cordova	5	138,355	1,564,805	8.8
Craig	2	46,411	489,416	9.5
Dillingham	3	159,258	1,640,774	9.7
Fairbanks	29	1,008,544	27,229,098	3.7
Galena	2	68,243	633,792	10.8
Haines	3	80,014	1,394,473	5.7
Hoonah	3	76,649	797,557	9.6
Hydaburg	2	17,709	376,242	4.7
Juneau	20	598,669	10,483,885	5.7
Kake	3	81,492	637,611	12.8
Kenai	25	712,841	16,096,784	4.4
Ketchikan	11	462,821	6,290,315	7.4
King Cove	2	54,413	564,793	9.6
Klawok			308,863	
Kodiak	10	328,126	5,570,104	5.9
Mat-Su	21	565,465	9,377,332	6.0
Nenana	4	93,579	819,871	11.4
Nome	4	186,770	3,061,708	6.1
North Slope	15	661,341	8,981,117	7.4
Pelican		16,718	148,333	11.3
Petersburg	4	91,508	1,564,171	5.9
Selawik		92,787	913,267	10.2
Sitka	7	228,434	4,201,098	5.4
Skagway	2	52,204	626,859	8.3
St. Marys	3	69,832	708,023	9.9
Unalaska	2	64,678	700,696	9.2
Valdez	6	133,483	2,634,410	5.1
Wrangell	3	99,087	1,469,859	6.7
Yakutat	2	73,397	561,076	13.1
REA				
Adak	3	88,347	1,751,724	.5
Alaska Central	4	108,553	1,511,837	7.2
Alaska Gateway	2	77,502	1,652,748	4.7
Aleutian Range	2	24,819	1,133,086	2.2
Annette Island	3	62,015	1,044,724	5.9
Bering Strait	10	48,475	1,991,028	2.4
Chatham	2	34,434	531,023	6.5
Chugach			227,542	
Copper River	5	103,590	2,556,690	4.1
Delta/Greely	5	126,290	2,325,525	5.4
Iditarod	4	63,161	1,396,839	4.5
Kuspuk	2	55,127	1,704,239	3.2
Lake & Peninsula	3	92,178	1,810,882	5.1
Lower Kuskokwim	11	278,889	5,749,557	4.9
Lower Yukon	8	102,019	2,656,178	3.8
Northwest Arctic	6	210,587	5,368,542	3.9
Pribilofs	2	45,269	545,084	8.3
Southeast Island	2	138	1,310,867	
Southwest	5	117,263	2,423,068	4.8
Yukon Flats	3	35,898	1,510,120	2.4
Yukon-Koyukuk	6	211,282	3,604,965	5.9
Total	383	$12,341,617	$236,494,762	5.2

[a] Vocational education allocations under the 1978 Public School Foundation Program were comparable, totaling $12,436,889.

[b] The Alaska Department of Education also spends about $577,900 annually on supportive services to school district vocational programs

SOURCE: State of Alaska, Department of Education, *Alaska Department of Education Annual Report, 1977-78,* October 1978, pp. 50-53.

Table 2

Public Postsecondary Vocational Education Program Costs in Alaska: FY1979[a]

	State and Local Sources	Federal and Other Sources	Total
University of Alaska System			
Anchorage Community College	$ 3,675,991*	$ 65,596	$ 3,741,587*
Juneau Douglas Community College (Business & Career Education)	541,790		541,790
Kenai Peninsula Community College	439,930		439,930
Ketchikan Community College	362,732		362,732
Kodiak Community College	217,418	4,000	[illegible]
Kuskokwim Community College	440,072	252,411	[illegible]
Matanuska-Susitna Community College	181,216		181,216
Northwest Community College	166,187		166,187
Sitka Community College	87,583		[illegible]
Tanana Valley Community College and UA/Fairbanks	980,953	191,231	[illegible]
Subtotal	$ 7,096,835	$ 513,238	$ 7,610,073
Other			
Alaska Skill Center	$ 1,575,300	$ 956,800	$ 2,532,100
Indian Action Program		884,000	884,000
Inupiat University		150,832	150,832[b]
Hutchison Career Center (adult component only)	785,904		785,904
Sheldon Jackson College		257,500	257,500
Department of Education: Adult Education and Vocational Training/Supportive Services[c]	53,116	201,116	254,232
Subtotal	$ 2,414,320	$ 2,450,248	$ 4,864,568
Total	$ 9,511,155	$ 2,963,486	$12,474,641
Addition:			
Alaska Federation of Natives' Job Corps Center:		$ 5,820,725	$ 5,820,725[d]

[a]Budget figures refer to the direct costs of the vocational education component of the institution and do not include associated administrative and other institutional costs unless the total institution is a vocational education facility. Thus, these figures underestimate the true costs of vocational education in Alaska.

[b]Costs in FY78. Inupiat University is reorganizing and has not determined its FY79 budget and curriculum.

[c]Estimated costs of postsecondary vocational education support only. Does not include costs of adult basic education, English as a Second Language and other programs administered in the adult education and career and vocational areas.

[d]AFN contract runs from December 11, 1978 to November 30, 1980.

SOURCE: FY1979 Working Budget, University of Alaska; "Survey of Alaskan Postsecondary Vocational Institutions," (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

(Continued from Page 2)

of Education, attempts to remedy this lack of information and provide an information base for systematic vocational education planning. We hope by presenting it here to help policymakers and other interested persons better understand the total vocational education system in Alaska and familiarize them with those problems in the system that so badly need attention.

ALASKA'S POSTSECONDARY VOCATIONAL EDUCATION SYSTEM

In 1978, forty-eight separate institutions offered postsecondary vocational education programs in Alaska (Table 3). Of these, sixteen were public or independent nonprofit institutions, seventeen were private schools, and fifteen were apprenticeship programs. These institutions operated 157 separate vocational programs, each leading to a certificate, associate's degree, license, or some other document of completion (Table 4). Public sector institutions accounted for almost 75 percent of the vocational programs offered.

Each of these sectors operates quite differently in terms of the basis for planning programs, the populations of students served, and the relationship to the labor market. The public and nonprofit institutions offer the largest number of vocational education

Table 3

Institutions Offering Postsecondary Vocational Education Programs: 1977-78

	Number
PUBLIC AND INDEPENDENT NONPROFIT INSTITUTIONS	
Community Colleges/University of Alaska	11
Anchorage Community College	
Juneau-Douglas Community College	
Kenai Peninsula Community College	
Ketchikan Community College	
Kodiak Community College	
Kuskokwim Community College	
Matanuska-Susitna Community College	
Northwest Community College	
Sitka Community College	
Tanana Valley Community College	
University of Alaska/Fairbanks	
Other	5
Alaska Skill Center	
Hutchison Career Development Center	
Indian Action Program	
Inupiat University of the Arctic	
Sheldon Jackson College	
Subtotal	16
PRIVATE INSTITUTIONS[a]	
Hairstyling Schools	4
Academy of Hair Design	
Anchorage School of Barbering	
Fairbanks Beauty School	
Trendsetters School of Beauty	
Flight Schools	9
Aero Technical Flight Service	
Alaska Central School of Flight	
Birchwood Air Service	
Dorsey's Flight Training	
Gil's Aircraft Service	
Neilson Aviation	
Northland Flight School	
Pat's Flying Service	
Wilbur's Flight Operation	
Real Estate Schools	3
The Real Estate School	
T & M Real Estate Institution	
Winey Real Estate	
Alaska Business College	1
Subtotal	17
APPRENTICESHIP PROGRAMS[b]	15
Asbestos Workers, Local No. 9	
Bricklayers, Local No. 1	
Carpenters Training Center, Anchorage	
Carpenters Training Center, Fairbanks	
Cement Masons/Plasterers	
Electrical Training Center	
Ironworkers Training Center	
Operating Engineers, Local No. 320	
Painters, Local No. 1140	
Piledrivers, Local No. 2520	
Plumbers & Pipefitters, Fairbanks	
Roofers, Local No. 190	
Sheetmetal Workers, Local No. 23, Anchorage	
Sheetmetal Workers, Fairbanks	
Total	48

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[a] Schools excluded from the listing are military-related flying schools, two modeling schools, and a school offering short preparation programs for travel agents.

[b] Apprenticeship programs that were not open in 1977-78 are excluded.

SOURCE: Alaska Commission on Postsecondary Education, 1977-78, *Directory of Postsecondary Educational Institutions in Alaska*; Institute of Social and Economic Research, "Survey of Alaskan Postsecondary Vocational Institutions"; *Survey of Programs and Enrollments—Postsecondary Schools,* National Center for Education Statistics, Department of Health, Education, and Welfare (forms collected by Alaska Commission on Postsecondary Education).

programs and enroll the most students, particularly minority group students. Compared to private schools or apprenticeship programs, these institutions tend to have a weak relationship with Alaska's labor market.

Public and Independent Nonprofit Institutions

Institutional Goals

Public and independent nonprofit institutions fall into two groups. One group consists of the community colleges which are primarily oriented toward meeting the needs in their regions. Most identify their target populations simply as regional residents (Table 5).

The other group of institutions are oriented toward the economically disadvantaged, particularly Alaska Natives. However, while some are moving toward this role, others are moving away from it. For example, the Alaska Skill Center began as an institution sponsored by the Manpower Development

Table 4

Number of Occupational Programs of Study Offered by Different Types of Postsecondary Institutions

Program	Type of Institution: Public Independent Nonprofit	Private	Apprentice	Total
Accounting Tech (5002)*	5	1		6
Aeronaut. & Aviation Tech (5302)				
Air Traffic Control	1			1
Aircraft Tech I, II, III	2			2
Aviation Admin. (5004)	1			1
Piloting	2	10		12
Barber		1		1
Business Mgt. Tech (5004)				
Business Admin.	11	1		12
Real Estate		3		3
Village/Business Mgt.	2			2
Chemical Tech (5305)	1			1
Computer Tech (5104)	2			2
Construction Tech (5317)				
Asbestos Workers			1	1
Bricklayers & Tilesetters			1	1
Building Const. & Maint.	5			5
Carpenter	1		2	3
Cement Mason/Plasterer			1	1
Electrical Tech	1			1
Heating & Refrigeration	1			1
Ironworkers			1	1
Heavy Equipment	1		1	2
Painter, Glazier, Floor Coverer			2	2
Piledriverman			1	1
Plumbers & Pipefitters			1	1
Roofers			1	1
Sheetmetal Workers			2	2
Cosmetologist (5006)		3		3
Drafting Tech (5304)	3			3
Educational Tech (5003)	3			3
Electronic Tech (5310)				
Electronic Tech	4			4
Lineman/Cable Splicer			1	1
Telephone Workers			1	1
Wireman			1	1
Fire Control Tech (5507)	3			3
Health Services & Paramedic (5200)	1			1
Community Health Prac. (5201)	2			2
(Continued, next column)				
Dental Assistant (5202)	1			1
Dental Hygienist (5203)	1			1
Medical Assistant (5214)	1			1
Medical Lab. Assist. (5205)	1			1
Nursing (5209)	2			2
Nursing Assist. (5201)	1			1
Home Economics Tech (5405)				
Early Childhood Educ.	5			5
Home Economics	1			1
Industrial Tech (5312)				
Petrochemical	3			3
Power House Operation	1			1
Power Tech	1			1
Library Assist. Tech (5504)	1			1
Mechanical Tech (5315)				
Auto Body 1 & 2/Auto. Tech	5			5
Dealer Service Training	1			1
Diesel Tech	3			3
Fork Lift Mechanic	1			1
Heavy Equip. Mechanic	1			1
Natural Science Tech (5400)				
Fishery Tech (5403)	1			1
Food Svc. Tech/Waitperson (5404)	5			5
Forestry Tech (5403)	2			2
Land Resource Mgt. (5403)	1			1
Marine Tech (5406)	2			2
Police, Law Enforcement	4			4
Corrections Tech (5505)	1			1
Printing Tech (5505)	1			1
Secretarial Tech (5505)	11	1		12
Social Work-Related Tech (5506)				
Para-Professional Counseling	1			1
Survey Tech (5309)	1			1
Welding Tech (5308)				
Non-Destructive Testing		1		1
Welding	5	1		6
Welding Inspector Training		1		1
Total	117	23	17	157

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*The programs have been numbered and grouped using the program classification system developed by the National Center for Educational Statistics. For more detail on this system, see U.S. Department of Health, Education and Welfare, Office of Education, *A Taxonomy of Instructional Programs in Higher Education*, 1970.

Training Act, but has since sought to attract a broader student body. In 1978, 27 percent of its students paid their own way.[2] Hutchison started as an institution designed to serve the chronically unemployed, but by 1978, the majority of its students consisted of local secondary school students taking vocational courses as part of their general education. The Indian Action Center, Inupiat University, and Sheldon Jackson College[3] all primarily enroll Alaska Natives.

These institutions consider job preparation to be the most important goal of vocational education. When asked to describe their most successful programs and the basis for program success, *every* institution named programs which they felt had high job placement rates.

Actually, many public vocational programs appeared to be serving quite different functions. While a few schools, such as the Alaska Skill Center, do focus on putting the unemployed to work, most community college programs were oriented differently. According to administrators, most of their students were already employed. Some were enrolled in vocational courses to upgrade their job skills. Others were enrolled not to acquire job skills but to acquire practical skills. "Hobbyists" was the way one community college president characterized them. They took automotive courses to learn how to work on their cars or carpentry courses to learn how to repair or build their houses.

In short, community college vocational programs appeared to be serving a mixture of functions: (1) job preparation, (2) skill upgrading, and (3) teaching practical skills. The job preparation goal, however, was the official mission and was publically cited as the measure of success.

Student Population

The poor quality of data available at the institutional level does not allow us to make reasonable estimations of the numbers of students in Alaska's public vocational institutions. A few schools, such as the Alaska Skill Center, could provide information on the numbers as well as characteristics of students enrolled in different vocational programs. However, most schools, especially the community colleges, lacked even the most basic item of information: how many individual students they are training in different programs. The only statistics routinely maintained were total community college enrollments or enrollments in single vocational courses that tended to be duplicative in cases where students took more than one course.

Table 5

Target Groups Identified by Alaskan Vocational Education Institutions
(percent distribution)

Oriented Toward Any Target Group	Public/ Independent Nonprofit	Private	Apprenticeship	Total
Yes	92	0	40	55
No	8	100	60	45
Total	100	100	100	100
Number =	13	5	10	28
Target Groups				
Unemployed	13		(17)	14
Economically Disadvantaged	12		(0)	9
Natives & Other Minorities	19		(17)	18
Youths	0		(17)	5
Females	6		(17)	9
Veterans	6		(16)	9
Handicapped	0		(16)	4
Regional Residents	44		(0)	32
Total	100		100	100
Number* =	16	0	(6)	22

*Some institutions named more than one target group.

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

As well as we can determine using course enrollment figures converted to full-time equivalents, the public sector vocational education institutions enrolled the equivalent of about 5,000 full-time students (Table 6). The number of individual students is undoubtedly substantially higher because many community college students are enrolled part-time in one or two courses. On the basis of estimates made by vocational education administrators, male and female students are represented in about equal numbers (Table 6). The proportion of Alaska Natives is about 25 percent of total enrollment (Table 6), only somewhat over the proportion of Natives in the general population (16 percent).[4]

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[2] Gerry Walsh, *An Identification of Vocational Education Training Activity in Alaska for Fiscal Year 1978*, prepared for Alaska State Advisory Council on Vocational and Career Education and State Manpower Services Council, 1978, 88 pp.

[3] Sheldon Jackson College emphasized that it does not consider itself engaged in vocational training. However, we have included it since some of its programs would conventionally be considered vocational training.

[4] Department of Labor, *Alaska Annual Planning Information FY1979*, 1978, p. 3.

Table 6

Estimated Characteristics of Students in Different Types of Postsecondary Vocational Programs: 1978

(percent distributions)

	Public/ Independent Nonprofit[a]	Private	Apprenticeship	Total
Race				
Native	25	3	16	21
Caucasian	72	91	77	75
Other	3	6	7	4
Total	100	100	100	100
Number of students used to estimate race proportions:	4,297	725	1,091	6,113
Age[b]				
Under 20	14	3	12	12
20-25	40	14	64	41
Over 25	46	83	24	47
Total	100	100	100	100
Number of students used to estimate age proportions:	4,624	560	686	5,870
Sex				
Male	52	42	93	47
Female	48	58	7	53
Total	100	100	100	100
Number of students used to estimate sex proportions:	4,921	727	1,091	6,739

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[a] Full-time equivalents. Since many community colleges enroll primarily part-time students, the number will substantially underestimate total individual student enrollment.

[b] Age estimations are based on fewer numbers of students due to lack of institutional information.

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978); *Survey of Programs and Enrollments—Postsecondary Schools*, National Center for Education Statistics, collected by the Commission on Postsecondary Education; Bureau of Apprenticeship and Training records.

Such estimations of student enrollment and characteristics may be useful for a general overview of the vocational education system. However, the crucial point is that many public institutions, particularly the community colleges, cannot themselves determine the numbers of individual students in vocational programs. Nor do they know to what extent students are preparing for jobs or pursuing other goals. Thus, they have no way of knowing whether their programs are turning out an oversupply of labor in particular training areas, particularly in the absence of follow-up studies, which few institutions carefully conduct.

Of the public institutions surveyed, 67 percent cited knowledge of vocational education student goals and life-style preferences as a major program need (Table 7). This need ranked even higher than the perennial problem of obtaining more funding for vocational facilities and equipment.

Graduation Rates

Few schools in the public sector kept systematic information on graduation rates. In 1978, the Alaska Skill Center reported that 60 percent of its students completed programs; the Indian Action Program, 47 percent; and Inupiat University, 37 percent.

Graduation rates for community college vocational programs are impossible to calculate since no information is available on the number of individual students enrolled in a program. However, comparing the number of graduates (certificate and associate's degree) to the estimated full-time equivalent students in a vocational program suggests that graduation rates may be extremely low. For many programs, information on both student enrollment and graduates was not available. For those programs where we had information, we estimated full-time equivalent student enrollment at 3,552 students. Yet, these programs graduated only 513 students, an almost 7-to-1 ratio of full-time equivalent students to graduates. Some community colleges had substantially lower ratios. One community college, for example, which had an estimated full-time vocational student enrollment of 782, had only twenty-two graduates, a ratio of over thirty-five full-time equivalent students to one graduate. The program areas of accounting, business

Table 7

Program Needs of Public Sector Vocational Education Institutions

(percent distributions)

Local Labor Market Information	67
Knowledge of Vocational Education Student Goals and Life Style Preferences	67
Development of Relationship with Employers	53
Funding for:	
Facilities/Equipment	40
Staff	47
Staff Training	27
Travel	40
Job Placement	27
Number = 15	

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

administration, and office occupations had particularly low numbers of graduates in view of their high enrollments. Alaska community colleges in 1978 awarded only 240 associate of arts degrees, and Anchorage Community College accounted for 72 percent of the degrees awarded (Table 8).

What is the basis of these (possibly) low graduation rates? The biggest reason, in the view of administrators, is that students quit because they find a job (Table 9). Personal problems, such as family need at home, alcoholism, and homesickness were also cited as major reasons for dropout. Others felt that graduation rates were unimportant because students were in the program to upgrade their job skills and were not interested in a degree. As one administrator said:

> Perhaps 90 percent of the students never intend to take the full program. They are looking for skill brush-up or just want to acquire adequate skills to get a job. Primarily, students don't complete programs because they get jobs.

That students are not interested in program completion in the first place may be the reason for the low number of graduates. But there may be other reasons. In a survey of adult education students in Fairbanks, for example, we found that over 50 percent of the students wanted to obtain at least an associate degree. Few students reported being enrolled only to get skills enough to qualify for a job. However, over 25 percent of the students felt that financial problems might prevent them from getting their degrees. Thus, many students, once they have attained the minimum skills needed for a job, may drop out and work not because they had planned on it, but because of financial need.

Program Areas and Program Planning

The largest number of programs in the public sector (Table 4) and the greatest numbers of students (Table 10) are concentrated in the following fields:

- Secretarial Technology
- Business Administration
- Accounting Technology
- Early Childhood Education
- Building Construction and Maintenance
- Food Service

Are these programs providing training in areas of Alaskan labor market needs or are they adding an occupational surplus to the job market and contributing to Alaska's unemployment problems? While this is a crucial policy question in vocational education, the public sector institutions have little means of answering it.

The Alaska Department of Labor provides information on statewide occupational employment

Table 8

Graduates of Community College Vocational Programs

Associate of Arts Degrees in Vocational Program Areas Awarded Through the University of Alaska's Community College System: 1978

Programs	Anchorage Community College	Other Community Colleges[a]	Total
Accounting	12	0[b]	12
Aeronaut. & Aviation Tech			
Air Traffic Control	10	0	10
Aircraft Tech	1	1	2
Aviation Admin.	4	0	4
Piloting	7	1	8
Business Management	27	11[b]	38
Chemical Technology	0	1	1
Computer Technology	4	0[b]	4
Construction Technology			
Heating & Refrigeration	0	4	4
Drafting Tech	7	0	7
Educational Tech	0	12	12
Electronics Tech	5	4	9
Fire Control Tech	11	0	11
Health Services			
Dental Assistant	12	0	12
Medical Assistant	3	0	3
Medical Lab.	6	0	6
Paramedic	1	0	1
Nursing	24	0	24
Home Economics Technology			
Early Childhood Educ.	3	1	4
Home Economics	3	0	3
Industrial Technology			
Petrochemical	10	8	18
Mechanical Technology			
Diesel Tech	0	1	1
Natural Science			
Food Service	3	0	3
Land Resource Mgt.	0	2	2
Police Administration	6	10	16
Secretarial Technology	7	7	14
Social Work-Related			
Para-Professional Counseling	0	2	2
Survey Technology	7	0	7
General Technology	1	1	2
Total	174	66	240

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[a] Includes one police administration A.A. graduate and one chemical science A.A. graduate from the University of Alaska, Fairbanks.

[b] Two A.A. degrees in computer technology, two in accounting, and one in business administration were awarded through the School of Management, University of Alaska, Fairbanks.

SOURCE: University of Alaska alumni records.

Table 9

Barriers to Program Completion in Public Sector Vocational Programs: Administrator Views

Student got a job	64%
Personal problems (family need at home, alcoholism, homesickness)	50
Just interested in skill upgrading	29
Unrealistic expectations	14
Number = 14	

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

and projected average annual openings over a five-year period. As discussed in detail in the second section, this information is of limited use to vocational planning. It does not cover many occupations relevant to vocational education, nor does it present the occupational information in a form that parallels vocational education categories. When occupations are arranged by vocational training areas (Table 11), it is clear that the major vocational program training areas parallel the occupational areas of highest projected demand. But projections of occupational demand alone can be misleading without some information on supply—the degree of competition that vocational program graduates face in the job market; the Alaska Department of Labor does not provide interpretable statistics addressing this problem.

Of the publicly-supported vocational education institutions, 67 percent considered lack of local labor market information to be a major program problem (Table 7). In the absence of sound labor market information, many vocational education programs were planned either on vague impressions about the labor market or on other grounds entirely (Table 12). For example, a program might be implemented on the basis of a study which discussed a general social need, such as that for Native corporation land management personnel. The vocational institution did not follow-up to determine if paying jobs were in fact available at the time they were training students. Vocational programs were also offered on the basis of student interest, regardless of the labor market implications. The desire to make use of an existing facility, such as a government installation, or to acquire a new building, was an unofficial but often important ground for starting vocational programs. "I would say we adapted the program to the building, not to the labor market," one vocational educator admitted.

Despite the surplus of skilled labor in Alaska during 1978 and the uncertainty of future economic improvements, vocational educators were considering starting a variety of new training programs (Table 13). In most of these areas, several similar training programs were already in existence. Community colleges especially had a regional focus which limited their interests to employment opportunities and other training activities in their areas. They gave little consideration to the mobility of students and their position in the labor market if they left the region. Nor were vocational programs specifically designed to help students from regions with poor job prospects compete in the statewide or national job market.

Placement

While student placement rates would be one reasonable way to determine if programs were producing an oversupply of labor, few institutions kept job placement records.[5] One notable exception, the Alaska Skill Center, devoted substantial effort to job development activities, kept student placement records, and reported placement rates of about 82 percent. However, most public institutions put little effort into job placement. Only two had placement offices (Table 14). Most reported that job placement was limited to informal efforts by certain teachers.

Some instructors made great efforts to place students with employers. Certain programs, such as Kenai Community College's Petroleum Technology program, had developed working relationships with industry that encouraged placement by combining classroom education with on-the-job training. However, other vocational educators took the position that their jobs ended in the classroom and did not accept employer contact as part of their role.

The payoff from contact with employers, however, can be substantial from the viewpoint of educational quality as well as helping students find jobs. As one instructor in the field of office occupations pointed out:

> If this (a cooperative class) were done on a large scale, we would know a lot more about employer needs. I found out a lot of things we shouldn't be doing, that we should be changing. We discovered that employers aren't giving timed typing tests from perfect copy any longer. They are making students correct copy and use their own judgment. We're still using the testing methods of the sixties. Now we are adjusting our testing to match the testing methods of employers.

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[5] While we asked institutions about job placement records in the survey, the responses were too limited or contradictory to be reliably coded.

Table 10

Estimated Enrollment of Vocational Education Training Programs in Alaska: 1977-78

Program	Public/ Independent Nonprofit[a]	Private	Apprenticeship	Total[b]
Accounting Tech (5002)	410	80		490+
Aeronautical & Aviation (5302)				
Air Traffic Control	50			50
Aircraft Technology	71			71
Aviation Admin. (5004)	18			18
Piloting	120	464		584
Barber		10		10
Business Mgt. Tech (5004)				
Business Admin.	528+			528+
Real Estate		425++		425++
Village/Business Mgt.	80			80
Chemical Technology (5305)	3			3
Computer Technology (5104)	153			153
Construction Technology (5317)				
Asbestos Workers			33	33
Bricklayers & Tilesetters			6	6
Building Const. & Maint.	223+			223+
Carpenter	7		243	250
Cement Mason/Plasterer			5	5
Electrical Technicians	23			23
Heating & Refrigeration	25			25
Heavy Equipment Operators	37		86	123
Ironworkers			61	61
Painter, Floorcoverer, Glazier			90	90
Piledriverman			10	10
Plumbers & Pipefitters			130	130
Roofers			31	31
Sheetmetal Workers			30	30
Cosmetologist (5006)		74		74
Drafting Technician (5304)	54			54
Educational Technician (5503)	169			169
Electronic Technician (5310)				
Electronic Tech	210			210
Lineman/Telephone Worker			366	366
Fire Control Tech (5507)	112			112
Health Services & Paramedic (5200)	47++			47++
Home Economics Tech (5405)				
Early Childhood Education	46++			46++
Home Economics	260			260
Industrial Tech (5312)				
Petrochemical	131			131
Power House Operator	18			18
Power Tech	NA			NA
Library Asst. Tech (5315)	28			28
Mechanical Tech (5315)				
Auto Body Automotive	141			141
Dealer Service Training	2			2
Diesel Tech	69			69
Fork Lift Mechanic	4			4
Heavy Equipment Mechanic	37			37
Natural Science Tech (5400)				
Fishery Tech (5403)	19			19
Food Service (5404)	327			327
Forestry Tech (5403)	18			18
Land Resource Mgt. (5403)	10			10
Marine Tech (5406)	NA			NA
Police Administration	68			68
Corrections Tech (5505)	75			75
Printing Tech (5505)	5			5
Secretarial Tech (5005)	824+	83		907+
Social Work-Related Tech (5506)				
Para-Professional Counseling	32			32
Survey Tech (5309)	40			40
Welding Tech (5308)	185+			185+
Total	4,679+ +++++ ++++	1,136++	1,091	6,906+ ++++++ +++++

[a] Full-time equivalents. Public sector enrollments are rough estimations because the community colleges do not have information on the numbers of students enrolled in vocational programs. Where a community college provided course enrollments in a vocational program, we calculated "full time equivalents" by multiplying course enrollments by 3 and dividing by 15. Where community colleges provided semester headcounts over three semesters of vocational education students, these headcounts were divided by 3. This is the procedure recommended by the National Center for Educational Statistics, but it results in a conservative estimation of enrollments.

[b] Represents an underestimation due to nonsurveyed institutions. Each + indicates omitted data from a training program.

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978); *Survey of Programs and Enrollments–Postsecondary Schools*, National Center for Education Statistics, as collected by the Alaska Commission on Postsecondary Education.

Accessibility

The strength of vocational education in the public sector is its geographical accessibility, low tuition rates, and minimal entrance requirements. Except for a few in Fairbanks, virtually all the vocational institutions within the private and apprenticeship sector are located in Anchorage. Public vocational institutions are distributed throughout Alaska (Table 15).

Tuition rates are generally low. At the community colleges, for example, tuition is $20 per credit hour or $320 to obtain a one-year certificate and $640 to obtain an associate's degree. While tuition is much higher at Sheldon Jackson ($2,290 per year) and Inupiat University ($1,800 per year), some form of government funding pays tuition for most of the students at these two schools and at the other public vocational programs.

(Continued on Page 13)

Table 11

Employment and Projected Job Openings in Areas of Vocational Training in Alaska

Types of Jobs	Estimated Employment 1978	Estimated Employment 1983	Average Annual Openings 1978-83[a]
Professional & Technical			
Aeronautical & Aviation Tech (5302)			
Air Traffic Controller	615	668	19+
Pilot	1,295	1,742	99+
Computer Technology (5104)			
Computer Specialist	532	750	50+
Drafting Technology (5304)			
Drafters	927	1,397	125+
Health, Technologists & Technicians (5200)			
Clinical Lab Tech	281	385	38+
Dental Hygienists	51	81	15++
Other Health Tech	155	243	21+
Natural Science & Chemical Technologies (5400 & 5305)			
Fishery Tech, Forestry Tech, Land Management, Marine	78	101	7+
Agriculture, Biology Techs (exc. health)	26	41	3+
Chemical Tech	26	41	3+
Survey Tech			
Surveyor	487	709	46+
Managers & Officers			
Business Management Tech (5004)			
Buyer, Sales, Loan Manager	3,494	4,638	318+
General Manager, Officials, Prop.	15,301	18,956	1,126+
Sales Workers			
Real Estate (5004)			
Real Estate Agent & Broker	523	608	32+
Real Estate Appraiser	64	81	4+
Clerical Workers			
Accounting Tech (5003)			
Bookkeeper	3,367	4,192	351+
Educational Tech (5503)			
Teachers Aide, exc. Monitor	689	1,154	145+
Library Assistant Tech (5504)			
Library Attendant, Assistant	192	263	31+
Secretarial Tech (5005)			
Office Managers	822	1,073	76+
Stenographer, Typist, Secretary	9,473	13,063	1,443+
Office Machine Operator	605	729	64+
File Clerk	343	425	39+
Statistical Clerk	549	749	65+
Clerical Supervisor	443	527	28+
Messengers & Office Helper	142	203	13+
Payroll, Timekeeping Clerk	389	527	48+
Shipping, Receiving Clerk	318	425	28+
Service Workers			
Cosmetology (5006)			
Hairdresser, Cosmetology	377	385	25+
Fire Control Tech (5507)			
Firefighter	733	972	54+
Health Services (5206)			
Health Aide	196	284	32+
Dental Assistant	214	304	36+
Practical Nurse	843	1,316	166+
Nurses Aide, Orderly	1,068	1,600	164+
Home Economics, Early Childhood (5405)			
Child Care Work (exc. Private)	1,285	1,883	214+
Food Service Tech (5404)			
Bartender	1,086	1,438	99+
Baker	240	284	18+
Waiter, Assistant	256	344	21+
Cook	2,696	3,645	320+
Waiter	2,509	2,671	345+
Food Worker, NEC	818	1,053	86+
Police, Law Enforcement, Corrections (5505)			
Police & Detective	1,253	1,843	135+
Crafts, Operatives, & Laborers			
Construction & Metalworking Crafts (5317)			
Asbestos, Insulation Worker	43	61	4+
Carpenter & Apprentice	3,009	3,443	147+
Electrician & Apprentice	1,050	1,215	57+
Glazier	93	142	11+
Bulldozer Operator	836	1,114	82+
Excavating & Grading Machine Operator	2,756	3,726	238+
Fork Lift, Tow Motor Operator	387	486	23+
Painter & Apprentice	523	567	24+
Plumber & Pipefitter	950	1,094	50+
Boilermaker	67	81	7+
Machinist & Apprentice	289	385	30+
Driller, Earth & Water	453	506	16+
Crane, Derrick & Hoist Op.	398	506	26+
Welder & Flamecutter	793	952	42+
Electrical Tech (5310)			
Household Appl. Mech	204	263	14+
Radio, TV Repairer	409	547	31+
Electricial & Electronic Tech	912	972	18+
Telephone Line Installer, Splicer	170	203	9+
Telephone Installer, Repairer	682	871	43+
Electric Power Line Installer, Repr	293	365	17+
Mechanical Tech (5315)			
Auto Body Repair	260	304	13+
Auto Mech & App.	1,939	2,532	138+
Heavy Equipment Mech (incl. Diesel)	2,169	2,714	145+
Aircraft Mechanic	983	1,337	85+
Air Cond. Heating, Ref. Mechanic	427	608	49+
Printing Tech (5009)			
Printing Trade, Craftmaker	144	162	7+

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[a] These projections are likely to be underestimations because openings resulting from employees who leave Alaska are not included. Users should add to these projections an additional number of openings based on their knowledge of the number of annual openings deriving from this source. A + is placed on each occupation to reflect this need.

SOURCE: Department of Labor, *Alaska Annual Planning Information FY1979,* May 31, 1978. These occupational projections are derived from the Alaska Department of Labor's in-house econometric model. The increase in employment is estimated on the basis of: (1) openings created by expanding industry, and (2) openings created by replacement needs resulting from death, retirement, disability, and temporary withdrawal from the labor force. In making these projections, increased employment resulting from a possible gasline construction or capital move was not considered.

(Continued from Page 11)

The public institutions have minimal enrollment requirements. A high school diploma is not a prerequisite. Generally, these institutions require only that their students be at least 18 years of age or else have a high school diploma or GED.

Attendance requirements are similarly flexible. Unlike students at private institutions, students need not sign a credit-hour contract. In community college programs, they can enroll for one or more courses without making a long-term commitment of either money or time.

Summary

In sum, the publicly supported sector affords opportunity to students who would otherwise be unable to enroll in a vocational education program. The flexible hours allow many students to continue to work. The minimal entrance requirements allow those who may not have successfully completed high school or who would do poorly on entrance examinations to continue their education. Private schools and apprenticeship programs are much more selective in the students they educate.

The accessibility of public vocational programs, however, to a less select group of students, makes it particularly important that these institutions develop means to actively help those students with job-related goals to find employment. Yet, few public vocational institutions are organized to perform this task. Sources of labor market information are poorly developed, and placement functions are weak. The community colleges may be performing other important functions in their vocational programs, such as career upgrading or teaching practical skills. These other functions, however, are often not official program rationales with an educational approach clearly directed toward them. The type of instruction needed for a course designed to teach people how to work on their cars, for example, is not necessarily the same as the instruction necessary to prepare students to be auto mechanics.

Table 12

Basis for Establishing Vocational Programs in the Public Sector: Administrator Views*

Local labor market demand	56%
Student interest	30
Advisory Council recommendation	8
Did not know	19
Number of programs = 87	

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*Percentages do not add up to 100 because more than one reason was given for thirteen programs

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

Table 13

New Vocational Education Programs Being Planned by Public Vocational Institutions: 1978[a]

New Program	Number of Institutions Planning New Programs	No. of Alaska Institutions Operating Programs[b]
Automotive	4	5
Building Const. and Maint.	1	5
Cosmetology	1	3
Diesel Technology	1	3
Heavy Equipment	1	2
Land Resource Mgt.	1	1
Piloting	1	12
Practical Nursing	1	2
Secretarial Tech	1	12
Welding	1	6
Bottom Fisheries	1	Possible overlap with on-going training programs
Tourism	1	
Justice	1	
Hotel/Motel Operation	1	
Total Programs Planned =	17	

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[a] This listing is an underestimation since it does not include vocational programs that the Job Corps facility will offer.

[b] Includes private and apprenticeship programs.

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

The Private Sector

While vocational institutions in the public sector offer many training programs, private schools tend to be small and to concentrate on training in a single field (Table 3). In 1978, private institutions primarily consisted of flight schools (9), hairstyling schools (4), and real estate schools (3). The private sector offered less than 15 percent of the vocational programs in Alaska during FY1978 and enrolled about 16 percent of vocational students. The private sector is also a more unstable industry. For example, 47 percent of the seventeen flight schools listed in the 1977-78 *Directory of Postsecondary Institutions* were out of business by the summer of 1978.

None of the private schools interviewed were oriented toward serving a target group (Table 5). Only 3 percent of their students were Alaska Natives and another 6 percent, other minorities (Table 6). Several of the institutions were interested in acquiring Comprehensive Employment Training Act (CETA) funds to support more Natives and disadvantaged students at their schools. However, tuition at private schools is high, which makes some agencies reluctant to make financial arrangements with the school. For example, tuition costs at the Anchorage School of Barbering are $1,500 for program completion, while at the Anchorage Business College, program completion costs range from $2,040 to $4,080. Moreover, while some schools offer monthly payment plans, a student must sign a contract for full program costs rather than paying on a semester-by-semester basis.

Compared with the open enrollment policy of the public schools, many private schools have more stringent screening practices and enrollment requirements. Alaska Business College, for instance, requires applicants to have a high school diploma or GED or else pass an entrance test. The state's three beauty colleges require applicants to have completed at least two years of high school.

Since private schools depend on student tuition for their survival, we cannot dismiss the possibility that they may not have accurately represented their completion and job placement rates. However, the private schools interviewed did appear to be much better linked to the labor market than the public institutions. They showed little interest in better labor market information because they believed they had already established reliable channels of communication with employers. As one commented:

> Students never have any problem getting a job. The school puts a lot of effort into working with employers and into placement.

Table 14

Placement Methods of Public Sector Vocational Education Institutions

(percent distributions)

Placement Procedures	
Placement Office	13
Informal Placement by Teachers	60
Other	7
None	20
Total	100
Number 15	

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

Table 15

Location of Alaska's Vocational Education Institutions

(percent distributions)

	Public/ Independent Nonprofit	Private	Apprenticeship	Total
Urban w/central. location	50	94	100	82
Urban w/rural extensions	6			2
Rural w/central. location	19	6		8
Rural w/village extensions	25			8
Total	100	100	100	100
Number	16	17	15	48

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978); Alaska Commission on Postsecondary Education 1977-78, *Directory of Postsecondary Educational Institutions in Alaska.*

Private schools reported program completion and job placement rates ranging from 75 percent to 100 percent. [6] "All graduates are working," said one school. "Jobs are waiting for students when they complete the training." These apparently high rates of program completion and job placement may be in large part the result of the selectivity of the schools, their consequently higher prestige and ability to guarantee highly qualified graduates, and the financial commitment required of students. However, it may also be the result of the school's interest in finding students jobs and of the informal system of relationships that the small private school may have developed with employers in their occupational area.

Apprenticeship Programs

Apprenticeship programs, as mechanisms for unions both to train and to restrict the supply of labor, have an organization quite different from other educational institutions. They are essentially "cooperative programs" which combine formal classroom training with direct work experience. Students do not pay tuition but receive wages for work performed on the job. Both the prospect of immediate earnings and the high wage rates and prestige of the skilled crafts make apprenticeship programs highly attractive to students. Competition for apprenticeship places is keen.

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[6] Real estate schools are an exception since many students take such training for reasons unrelated to finding employment, such as to speculate on real estate or buy a house.

Of the 157 vocational programs operating in Alaska in FY1978, 11 percent were apprenticeship programs. These programs enrolled approximately 16 percent of Alaska's vocational students.[7]

Apprenticeship programs have much more stringent entrance requirements and general screening processes than the other sectors. Most of the programs require applicants to take the General Aptitude Test Battery (GATB). Others require applicants to take the GATB plus a qualifying exam which tests basic mathematics proficiency. All apprenticeship programs have age requirements. Applicants usually must be between 18 and 30 years old. In addition, they must pass an interview which covers such areas as work attitudes, judgment, and sense of responsibility.

Apprenticeship programs serve a much narrower range of students than the public or private sectors. Students are primarily white males between the ages of twenty and twenty-five (Table 6). However, the efforts of such organizations as CETA and Apprenticeship Outreach to get Natives and other minorities into apprenticeship programs may be bearing fruit. In our interview, 40 percent of the apprenticeship programs reported a target group (Table 5). According to the Bureau of Apprenticeship Training Statistics, Alaska Natives comprised 16 percent of the FY1978 enrollment in apprenticeship programs (Table 6), about their proportion in the general population. Efforts to bring females into apprenticeship programs have been less successful. Only 7 percent of apprentices in 1978 were female.

Apprenticeship programs furnish the best examples of vocational program planning based on labor market demand. The number of new students accepted is based on the number of employed journeymen. When many union members are out of work, as occurred during 1978, few students are trained. Of the thirteen apprenticeship programs examined during the summer of 1978, six were virtually closed due to the high proportion of union members out of work. As one program director explained:

> The work situation looks very poor. We have one hundred apprentices now and only ten are working. We want to be careful about taking more than we can find work for.

The union system of making educational openings almost entirely contingent upon labor market demand prevents fields from becoming excessively saturated with workers. However, it means that training comes to a standstill when the economy takes a downturn. The generation of students who would ordinarily be entering apprenticeship programs at this stage in their lives are denied these career opportunities. While we argue in this study that vocational programs with the goal of job preparation should be more closely geared to the labor market, it would obviously be infeasible to close down educational facilities to this extent each time employment rates dipped. Nonetheless, greater attention to labor market demand would enable public vocational resources to be more accurately channeled into areas of training which provide the greatest opportunity.

PROBLEM AREAS IN VOCATIONAL EDUCATION

Vocational education problems in Alaska occur primarily in the publicly supported institutions. These are institutions that affect the largest number of vocational students. These are also the institutions which enroll that group of Alaskan students who have few of the special qualifications needed for success in the job market. Thus, it is of considerable importance to identify major problem areas and explore means of addressing them.

1. Confusion About the Relevant Goals of Vocational Education in Alaska

Preparation for Jobs in the Community or Outside the Community

Alaska is a very difficult state in which to develop vocational education programs relevant to the labor market and the job needs of the unemployed. First, Alaska has a very small employment base. The entire number of nonagricultural jobs in Alaska in 1979 totaled only about 165,400.[8] Fewer jobs exist in the entire state of Alaska than in the city of Tucson, Arizona. The small number of jobs, particularly in specialized occupational areas such as dental hygiene or computer programming, make it difficult to plan vocational programs which do not quickly saturate the job market.

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[7] While twenty-four Alaskan apprenticeship programs are listed in the Anchorage Training Information Center's *Apprenticeship Information: A Handbook for Guidance and Employment Counselors*, September, 1977, we included only fifteen programs, essentially those operating in FY1978. However, estimates of the number of programs operating in FY1978 vary because of discrepancies in whether the program was "closed" due to the high unemployment of union workers.

[8] *Alaska Annual Planning Information, FY1979*, p. 10.

Second, the largest numbers of jobs available in Alaska are located in Anchorage, while the highest rates of unemployment are found in communities outside the Anchorage area, such as Bethel and Fairbanks. Vocational programs in those economically depressed communities are under special pressure to prepare unemployed residents for jobs, but few regional job openings exist. Moreover, future job developments, such as the gas pipeline or bottom fisheries, tend to be highly uncertain.

Third, the high rate of migration to Alaska during "boom" periods quickly expands the skilled labor supply. Between 1970 and 1977, for example, Alaska's civilian labor force increased by 90 percent, primarily as a result of pipeline construction.[9] Graduates of Alaskan vocational programs will find themselves competing for available jobs with a large pool of migrants, including highly trained workers who cannot find employment and are willing to settle for jobs for which they may be overqualified.

Vocational programs in Alaska are under political pressure to prepare students for jobs in Alaska and often in their local communities. In some training areas, this goal may make sense. For example, teacher aide training for rural residents appears to have high employment potential. Vocational programs are particularly apt to lead to local employment when arrangements are made with employers so that the vocational program serves as a form of preservice or in-service education.

For many communities, however, preparing students for local jobs may be a largely futile enterprise. Planning vocational programs that enable students to migrate from job-scarce to job-plentiful regions of the state and also out of the state may have greater benefit for individual students. However, educators in planning vocational programs rarely take into account the statewide labor markets, much less the national. Community colleges especially have a focus on serving local communities, which restricts their point of view. However, local students may not be nearly as "place-bound" as is commonly assumed. The survey of vocational education students in Fairbanks, for example, showed that only about 40 percent of those students planning to use their training for a job were interested in jobs only in Fairbanks. Of the group, almost 40 percent indicated they could seek employment in Anchorage and about 35 percent said they could move anywhere in Alaska. Many students in community colleges are young single people who travel extensively or are attached to families that may decide to leave Alaska. Indeed, those schools which have attempted to do follow-up studies of program graduates often find the task extremely difficult precisely because of the high rate of student mobility which makes it hard to locate former students.

> **RECOMMENDATION: Vocational educators should determine the extent to which their students may be interested in employment outside their region. If large numbers of students are mobile, both statewide and national labor market needs should be taken into account in planning vocational programs.**

Job Skills Versus Practical Skills

Many vocational programs in Alaska perform functions other than job preparation. Students may take welding courses, for example, not to become welders but to learn how to fix their sleds or snowmachines. In the survey of Fairbanks vocational education students, for example, about 35 percent were enrolled in vocational programs to develop vocational skills and about 30 percent were taking courses to develop useful practical skills. Others were enrolled for such reasons as career upgrading or obtaining a degree.

Vocational programs with practical education goals perform important services. In those rural communities that lack repair facilities, for example, knowing how to repair equipment not only saves money but also makes it possible to reuse rather than abandon equipment. Teaching practical skills is a function of vocational education that is particularly appropriate to Alaska with its small, isolated communities and tradition of individual self-sufficiency. In fact, such educational goals may increase personal well-being far more than vain attempts to train the unemployed for speculative or nonexistent jobs.

The problem lies in the confusion of job skills versus practical skills as program goals. The two types of programs require different program content, different planning methods, and different evaluation criteria.

The primary method of evaluating vocational education programs, for example, is to calculate the proportion of graduates who are employed in jobs relevant to their training. CETA prime sponsors and legislators press vocational educators for follow-up studies on job success. Yet, such a criterion is irrelevant if most students are enrolled to upgrade their job skills or to acquire practical skills.

In sum, at least four different types of vocational programs make sense in Alaska. Figure 1 summar-

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[9] *Ibid.*, p. 6.

Figure 1

Goal Alternatives for Alaskan Vocational Programs

	Major Program Rationale	Target Students	Major Planning Methods	Labor Market Relationship	Major Evaluation Criteria
TYPE I JOB PREPARATION FOR THE LOCAL LABOR MARKET	Frequent local job openings; a substantial number of students tied to the community	Unemployed; new job-seekers	Local employer surveys; contacts; student interest	Strong local employer relationships; cooperative education stressed; job development activities	Job placement
TYPE II JOB PREPARATION FOR THE STATEWIDE AND NATIONAL LABOR MARKETS	Few local job openings; substantial number of mobile students	Unemployed; new Job-seekers	Statewide and national information on job shortage and job surplus areas; statewide and national industry contacts; student interest	Contact w/major statewide employers and state and national trade associations; cooperative education stressed through summer/semester programs; job development activities	Job placement
TYPE III CAREER UPGRADING	Potential for increased job skills, earnings and career mobility	Employed community residents	Local employer contacts; occupational mobility analyses; student interest	Strong local employer relationships	Increase student earnings and occupational mobility
TYPE IV PRACTICAL SKILLS FOR PERSONAL USE	Potential for reducing cost of living and providing technical skills important to local life styles	Community residents	Analyses of local life styles and useful practical skills; student interest	Not applicable	Student enrollment

izes these alternatives and their program implications. Each type, however, makes sense in a different set of circumstances. While some programs may be able to combine several of these goals, each emphasis requires a particular set of planning and evaluation methods and support services.

> **RECOMMENDATION: Vocational educators should determine what types of program goals are appropriate for their communities and student populations. These goals should guide decisions about program content, planning and evaluation methods, and funding priorities.**

2. Lack of Information on the Alaska Labor Market

Vocational education programs oriented toward job preparation need to be much better linked to the labor market than is currently the case in many publicly supported vocational education institutions. Figure 2 illustrates the types of relationships that are important to a program seriously concerned with helping students get jobs. One of the main problems of vocational programs is the lack of usable information on local and statewide labor markets. The projections of occupational demand produced by the Alaska Department of Labor appear to be fulfilling the need for Alaska occupational information. However, as described below, these occupational projections in their present form provide little assistance in vocational planning.

Vocational educators emphasized the need for information on the Alaska labor market, particularly at the regional level. As one community college president said:

> Our biggest need is for labor market demand projections through, say, 1982. We get information on current job openings, but this doesn't help in planning new programs or deciding what to do with existing programs.
>
> We also need to know where jobs will occur so we can advise students about possibilities of having to relocate to find employment.

The Alaska occupational employment forecast, which is produced by the Alaska Department of Labor's (ADL) Research and Analysis section through an in-house econometric model, is the best source of information available. These projections are intended "to supply partial answers to the questions of: how many job openings will be available in Alaska from 1978 to 1983; what kind of jobs they will be; and consequently, what training or education will be required of, or beneficial to, future jobseekers?" [10]

As a basis for vocational planning, however, they have serious weaknesses:

1. The listed occupations do not correspond to the occupational output of many training programs. A number of the occupational categories are too broad or combine skilled and unskilled workers.
2. Little regional information is provided. Experienced observers report major differences in labor market needs in different regions of the state, particularly rural and urban Alaska. [11]
3. Openings which result from jobholders leaving Alaska are not included. Projections of average annual openings are made on the basis of (a) occupational growth and (b) occupational replacement needs which derive from death, retirement, disability, and temporary withdrawal from the labor force. Emigration from a state is not a component of job replacement needs nationally, the basis of this methodology. However, it is likely to be an extremely important source of job openings in Alaska with its high rate of population turnover.

Knowledgeable users often have little confidence in these labor market projections since they do not correspond to their personal experience with the job market.[12] In general, these projections are likely to underestimate average annual job openings.

Most of the problems with ADL's projections, such as the paucity of regional information, are inherent limitations of econometric modeling (the best available method) as a basis for projecting occupational demand. However, vocational educators are given little assistance or guidance in interpreting this information. The most common error, which appears continually in vocational planning documents, is to use *occupational demand figures alone as a basis for determining training needs and to pay no attention to supply—the competition trainees will face in seeking jobs.* Alaska's chronically high level of unemployment creates a large pool of unattached workers

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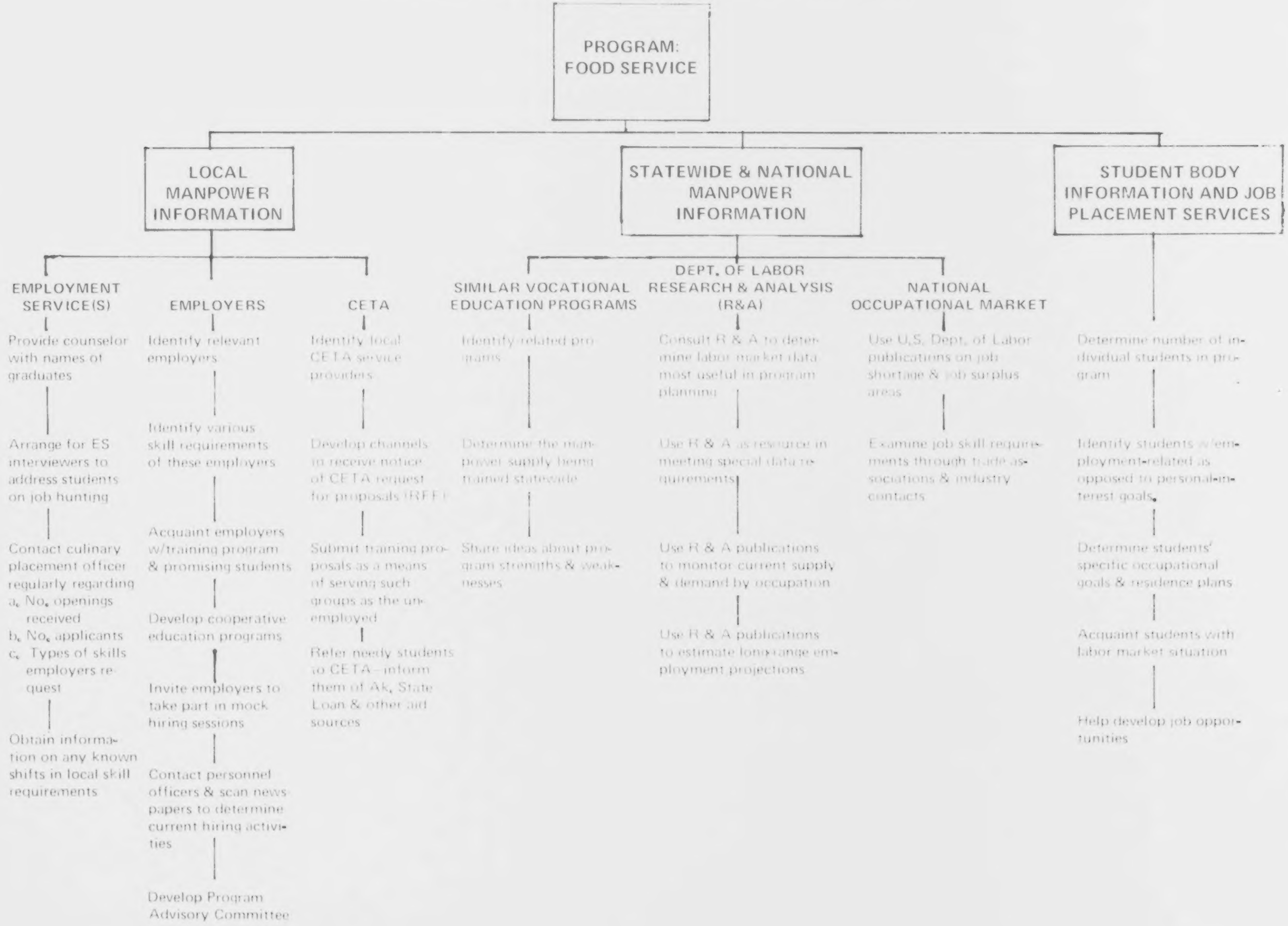
[10] Department of Labor, *Alaska Annual Planning Information, FY1979*, 1978, p. 12. The crucial table is "Estimated Employment by Occupation and Growth and Replacement Needs in Alaska," pp. 16-20.

[11] See the comments on occupational shortage and surplus areas from different employment centers, Alaska Department of Labor, *Occupational Supply and Demand*, 1978.

[12] Job openings resulting from turnover, where a jobholder leaves his present job and takes a job in the same field, are also not included in labor market projections since these jobs do not represent new openings. Such job turnover, however, may create an impression of greater demand than is actually present.

Figure 2

A Vocational Education Program Linked to the Labor Market


PROGRAM: FOOD SERVICE
LOCAL MANPOWER INFORMATION
STATEWIDE & NATIONAL MANPOWER INFORMATION
STUDENT BODY INFORMATION AND JOB PLACEMENT SERVICES
EMPLOYMENT SERVICE(S)
Provide counselor with names of graduates
Arrange for ES interviewers to address students on job hunting
Contact culinary placement officer regularly regarding
a. No. openings received
b. No. applicants
c. Types of skills employers request
Obtain information on any known shifts in local skill requirements
EMPLOYERS
Identify relevant employers
Identify various skill requirements of these employers
Acquaint employers w/training program & promising students
Develop cooperative education programs
Invite employers to take part in mock hiring sessions
Contact personnel officers & scan news papers to determine current hiring activities
Develop Program Advisory Committee
CETA
Identify local CETA service providers
Develop channels to receive notice of CETA request for proposals (RFP)
Submit training proposals as a means of serving such groups as the unemployed
Refer needy students to CETA—inform them of Ak. State Loan & other aid sources
SIMILAR VOCATIONAL EDUCATION PROGRAMS
Identify related programs
Determine the manpower supply being trained statewide
Share ideas about program strengths & weaknesses
DEPT. OF LABOR RESEARCH & ANALYSIS (R&A)
Consult R & A to determine labor market data most useful in program planning
Use R & A as resource in meeting special data requirements
Use R & A publications to monitor current supply & demand by occupation
Use R & A publications to estimate long-range employment projections
NATIONAL OCCUPATIONAL MARKET
Use U.S. Dept. of Labor publications on job shortage & job surplus areas
Examine job skill requirements through trade associations & industry contacts
Determine number of individual students in program
Identify students w/employment-related as opposed to personal-interest goals.
Determine students' specific occupational goals & residence plans
Acquaint students with labor market situation
Help develop job opportunities

who are competing with vocational training program graduates for job openings. Immigration also brings a continuous supply of jobseekers to the state who have skills in vocational training areas. For example, 34 percent of the female migrants to Alaska between 1965-70 were clerical workers and 23 percent of the males were craftsworkers.[13]

The projection of occupational supply is a field still in its infancy and reasonable projections of the future supply of labor by occupations cannot be made.[14] However, information on supply and demand in the current job market can be obtained. Vocational programs place trained labor in the job market in a short time span (a few months to 2 years) so information on current job conditions is highly relevant.

The Alaska Department of Labor collects and publishes some information relevant to current job conditions. One source is the previous occupations of the insured unemployed. The other source is a count of applicants and openings in various occupational fields at employment centers.[15]

This information could be presented in a form much more useful to regional vocational planning. For example:

1. Job applicant and insured unemployment information could be broken into occupations relevant to vocational education planning. For example, clerical workers (a vocational program area) are presently combined with sales workers (not a program training area) in descriptions of the previous occupations of unemployed.
2. Information could be given on total *annual* job openings and total *annual* job applicants in an occupational category. It is the ratio of total openings to total applicants that is the critical figure.[16] For purposes of vocational planning, the present series is misleading.
3. Regional breakdowns could be given on the characteristics of the unemployed, job openings, and job applicants.
4. An interpretive analysis of regional surpluses and shortages of occupations as well as the reasons for the situation (such as poor pay and working conditions versus lack of skilled applicants) by the Employment Service staff would be valuable.[17]

To illustrate the problems in attempting to use current Department of Labor information for vocational planning, let us use the clerical field as an example. Information on this occupational area is indeed substantially better than on most others since labor market data specifically breaks out various categories of clerical workers.

Suppose a vocational educator has the following question: On the basis of current and anticipated labor market conditions, should this institution set up a new secretarial program? The occupational employment forecast in *Alaska Annual Planning Information* suggests a healthy future demand for clerical workers:

> More than 3,700 job openings are expected, on the average, for clerical occupations each year through 1983. The stenographer, typist and secretarial occupations can look forward to about 1,440 vacancies each year.[18]

If the vocational educator chanced to turn to a later section of the report dealing with employment service applicants and openings, he would find different statistics which suggest a substantial oversupply of clerical workers:

> The number of applicants for clerical positions, like the number for professional positions, was approximately three times as great as the number of openings received.[19]

This statement may well be an error of interpretation, resulting from failure to recognize the problem of carryover of active applicants from month to month. If the vocational educator made a special request to Research and Analysis for annual information on applicants and openings in the clerical area, he would find yet a different situation, suggesting clerical supply was just about in balance with demand (Table 16). Yet, the sizeable number (11 percent) of unemployment insurance weeks claimed by individuals previously in the clerical and sales fields also raises the possibility of an oversupply of clerical workers.

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[13] Daniel A. Seiver and John A. Kruse, *Who Migrates to Alaska?* Man in the Arctic Program Working Paper (Fairbanks: University of Alaska, Institute of Social and Economic Research, 1977). More recent information is unavailable.

[14] For a discussion of this problem, see David E. Kidder, *Review and Synthesis of Research on Manpower Forecasting for Vocational-Technical Education* (Columbus: Ohio State University, 1972).

[15] This information is reported in *Alaska Annual Planning Information* and *Alaska Economic Trends*, State of Alaska, Department of Labor.

[16] The Research and Analysis section in the Alaska Department of Labor can provide this information upon individual request (see Table 16). The published data series lists currently active applicants (an overcount since applicants from previous months are counted unless they call to have their names taken off the list), job openings in one month alone, and the percentage of hard-to-fill openings (which may be shortage occupations due to low pay or poor working conditions, not lack of trained labor).

[17] State of Alaska, Department of Labor, *Occupational Supply and Demand* (Juneau, 1978) contains examples of such an analysis, but it is too casually done to be reliable.

[18] *Alaska Annual Planning Information*, p. 13.

[19] *Ibid.*, p. 30.

Table 16

Job Applicants and Job Openings in Certain Occupations Related to Vocational Training: 1977

Types of Jobs	Statewide		Anchorage Only	
	Applicants	Openings	Applicants	Openings
Clerical				
Secretaries	1,176	1,196	418	299
Steno, Typing, Filing & Related	187	178	98	98
Bookkeeping	775	475	333	226
Computer & Account Recording	2,319	1,715	985	830
Food Service				
Waiters, Waitresses & Related	1,513	1,822	620	998
Bartenders	498	93	212	36
Misc. Cooks, Exc. Domestic	541	202	192	53
Kitchen Workers	757	978	320	489
Machine Trades				
Motorized Vehicle & Engine Rep.	1,119	654	423	410
Aircraft Repairing	323	47	194	37
Structural Work				
Excavating, Grading & Related	149	98	43	63
Carpentry	2,200	1,307	735	425
Plumbing, Gas Fitting & Related	483	203	180	89
Misc. Construction	1,631	1,472	409	277
Misc. Structural Work	421	360	177	135

SOURCE: Research and Analysis Section, Alaska Department of Labor, Special Information Request.

If the vocational educator also consulted the general comments on the clerical job situation made by each employment center in 1978, he would find clerical shortages reported in certain areas, such as Bethel and Nome. In other areas, he would find an oversupply of applicants for clerical positions, except for applicants with a high degree of skill and experience.[20] However, these regional interpretations in some instances contradict common experience (such as listing "secretary" as a shortage occupation in 1978 in Fairbanks).

After spending many hours working with Department of Labor staff on how to interpret their labor market data, we finally asked a Department of Labor analyst, "what would you do if you wanted to start a vocational education program with the best prospects of putting people to work?" "Worry a lot," the analyst replied.

> **RECOMMENDATION: The Alaska Occupational Information Coordinating Committee (AOICC), (an agency set up under the Vocational Education Amendments of 1976 specifically to deal with the problem of making available occupational information for statewide planning), should make the development of useful Alaska labor market information its first priority.**
>
> **RECOMMENDATION: The Research and Analysis Section of the Alaska Department of Labor should improve the presentation of Alaska labor market information in its current publications. Regional labor market information should also be provided through carefully done descriptive reports from local manpower offices.**

While improved labor market information from external sources such as the Department of Labor would be of great value, vocational educators need to develop their own sources of vocational information. Private schools and apprenticeship programs had less need for labor market statistics since they were already in close contact with employers.

Traditionally, vocational educators in the public sector have not been effective in establishing links with employers. Studies of this dilemma suggest three major problems:[21]

1. Vocational institutions have a poor organizational structure on which to relate to industry and build cooperative efforts.
2. Vocational institutions do not provide adequate staff for developing industry-education cooperation.
3. Vocational staff members, who generally come from education rather than industry backgrounds, do not know much about the structure and motivation of business and industry.

Alaska is not an exception to these national problems. Typically, vocational institutions do not delegate to specific staff formal responsibility for keeping in contact with employers, helping students find jobs, or conducting student follow-up studies. These essential activities are left to the discretion of program heads or individual instructors.

A Labor Market Information Advisory Committee

In the absence of published regional labor market information, vocational institutions can develop their own sources. Use of an advisory committee is one such method. However, unless the advisory committee consists of several major employers from each program area in which vocational training is taking place, the committee's knowledge of occupational conditions may be primarily anecdotal.

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[20] *Occupational Supply and Demand*, pp. 13-27.

[21] These observations were made by Samuel Burt based on a national study on industry participation in vocational education for the W.E. Upjohn Institute for Employment Research. Cited in F. Parker Wilbur, "Advisory Committees and the Business Curriculum" (Los Angeles: Los Angeles Technical College).

The Employer Survey

The employer survey is generally a far better approach to developing local labor market information than the advisory committee. Local employers are systematically queried about their current and expected manpower requirements, skill requirements, and ports of job entry. However, this method has its drawbacks. It is costly in staff time. Employers may be inaccurate in projecting their own employment needs and may project a greater number of openings than anticipated to encourage training that ensures them a pool of applicants. But, the local employer survey also has a number of advantages. It can provide good, quick estimates of short-term manpower requirements. Most important, it can help the vocational institutions communicate with local employers. It can help schools become more knowledgeable about employer needs, their curriculum implications, how the job market works, and how they can make their graduates competitive. Where the major vocational program goal is job preparation for the local labor market, local employer surveys are invaluable.

No single method of forecasting manpower requirements will provide vocational educators with "cookbook" information for program planning. Different program goals also require different labor market sources. In general, however, vocational educators need to use a combination of methods:

1. Local employer surveys and opinions of area experts obtained by the vocational institutions.
2. Statewide occupational projections and information on regional and statewide job applicants and job openings published by the Alaska Department of Labor.
3. National occupational projections and information on job applicants and openings published by the U.S. Department of Labor.

RECOMMENDATION: Vocational education institutions should delegate formal responsibility for labor market analysis to a staff member. This staff member should become knowledgeable in how to conduct local employer surveys and how to use and interpret diverse sources of labor market information.

Manpower need is, of course, not the only consideration in planning a vocational program, even when the fundamental goal of the program is job preparation. The Iowa Priority Program suggests the following technique for making decisions about vocational education priorities.[22]

A. Manpower Needs — 30 points
B. Availability of Students — 40 points
    1. Student Interest
    2. Student Need
C. Program Effectiveness—30 points
    1. Attrition Rates
    2. Placement Rates
    3. Cost-Benefit Comparison

Better manpower forecasting alone will not necessarily orient vocational programs to the labor market. Manpower projections are used as justifications for starting a program but rarely for terminating it.[23] Staff and plant are already in place. However, reasonably adequate labor market information is an essential component to vocational education planning and to responsible outside criticism of the system.

3. Lack of Attention to Job Placement and Job Development

Vocational institutions are strategically situated to help residents compete for the limited supply of jobs in many areas of Alaska. According to the institutions surveyed, almost all students were Alaska residents. If job training were more closely linked to job placement strategies, the vocational education system could help give Alaskan residents a competitive advantage in a tight job market. To the extent that Alaskan residents are more stable employees than recent migrants, employers would also benefit from reduced job turnover costs.

However, job placement is not an important activity in most public vocational institutions. As previously discussed, few institutions have placement offices or formally delegate job placement responsibility. While lack of funding is the common explanation for this inattention, money for job placement was the lowest funding priority of all vocational institutions (Table 7). The problem may be as much staff attitude and institutional priorities as inadequate funding. Many vocational educators have little interest in job placement. Student enrollment, not graduation or job placement rates, is the visible indicator of program success.

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[22] *Iowa Priority Program Areas Requiring Specialized Training of Less than Baccalaureate Degree* (Des Moines: Iowa State Department of Public Instruction, 1971). (ED 106 655)

[23] Kay Adams, *National Large Cities Vocational Education Needs Study* (Columbus: Center for Vocational Education, 1977). (ED 141 572)

Job placement must consist of substantially more than posting random job openings or providing a local Employment Service office with a list of graduates. Where job openings are scarce, the heart of job placement is *job development*—that is, capturing for students what jobs are available.

Job development typically consists of a range of activities.[24] For example, at the Alaska Skill Center, it includes:

- Scanning newspapers and contacting personnel officers to determine where hiring is taking place and alerting qualified students to these openings.
- Personally recommending qualified, interested students to potential employers.
- Traveling around the state contacting employers; determining their training needs, hiring patterns, and soliciting from them suggestions for program content.
- Inviting employers to address students and instructors on their needs and requirements and holding mock interviews.

These activities also help orient curriculum to employers' needs. As the Alaska Skill Center pointed out:

> We get comments from employers, '. . . you don't teach your people to use egg pans, you use a grill. Nobody uses grills anymore.' So we went out and bought a dozen egg pans. It's the kind of thing that doesn't make a big splash, but all the little changes add up and make a big difference . . .

RECOMMENDATION: Job placement and job development activities should be an essential component of Alaska vocational education programs which have job preparation goals. Specific vocational education funds should be allocated for placement activities.

Many vocational training institutions, particularly the community colleges, are too small to justify their own job developer. The teaching staff should assume some job development activities since the instructors are the ones most familiar with the occupational field and individual students. However, the activities of local instructors are generally confined to the local community. Job development may require negotiations with outside employers or agencies in the early stages of a proposed activity. For example, it might require convincing an agency to use paraprofessionals trained at the community college in a new program. The need is for a statewide job developer who works with different institutions. Another important statewide vocational education role is the coordination of activities of different vocational institutions. Vocational institutions often plan programs in isolation, duplicate other institutional efforts, and contribute to an oversupply of labor in particular fields.

RECOMMENDATION: The Alaska Department of Education should assign to specific vocational education staff members the role of assisting all public vocational institutions with job development activities and also of coordinating vocational education program planning.

Another effective strategy for helping vocational students capture scarce jobs is cooperative education, which uses employment experience as part of the educational program. It is particularly useful in programs designed to prepare students for the local job market, since the student becomes a known entity, not one of a mass of job applicants. Employers may also count cooperative experience as employment experience, an important advantage in a tight job market where job openings have experience requirements.

On the national level, cooperative programs have been growing rapidly in postsecondary vocational institutions.[25] They have become increasingly prevalent in business and office occupations, trade and industrial programs, and health programs. Typically, the employer provides salary, experience, and skill training, and the vocational institution monitors and gives credit for the work experience. In a national assessment of postsecondary cooperative education from 1975-77, Cohen found:

1. A postsecondary program that provides the student with a cooperative education experience is far more valuable to the student in terms of career selection and preparation than the same program would be without the cooperative educational component.
2. Cooperative education programs are an important source of student financial aid, particularly for low-income and minority students.
3. Cooperative education increases a student's rate of financial return from schooling.

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[24] See Robert Gibson and Marianne Mitchell, *Identification of Effective Concepts and Practices in Placement and Follow-up Services and Incorporation, into Pre- and/or In-service Training of Local Personnel to Implement Local Placement and Follow-up Efforts* (Columbus: Center for Vocational Education, 1976) (ED 134 804); and Robert Gibson, *A Guide to Developing School Based Placement and Follow-up Programs* (Bloomington: Indiana University) (ED 134 715). See also references listed in Appendix.

[25] Alan Cohen, Robert Deane, and Steven Frankel, *Cooperative Education: A National Assessment* (Silver Springs, Maryland: Applied Management Science, 1977). (ED 148 236)

4. Employers realized substantial financial benefits from cooperative programs since cooperative students performed similar work as regular employees at reduced pay and fringe benefits.
5. The majority of employers indicated that a very important benefit of cooperative participation was that it aided them in finding potential permanent employees.[26]

RECOMMENDATION: Alaska vocational institutions should incorporate cooperative programs as much as possible into their educational programs and use cooperative education as a job placement strategy.

4. Low Numbers of Graduates

The low number of graduates in some vocational programs, particularly in the community colleges, requires investigation. There may be no problem. As administrators suggest, the major cause may be that many students had no intention of completing a program.[27] Perhaps they were interested in acquiring just enough skills to get a job, in upgrading current job skills, or acquiring practical skills. However, this situation may also indicate dissatisfaction with program quality or financial problems which such strategies as cooperative education may help solve. Moreover, students who leave programs at low skill levels may be in a poor long-term labor market position even if they locate an immediate job.

RECOMMENDATION: Vocational educators should calculate completion rates in different program areas, determine the causes of low rates, and inform students about their position in the job market at varying skill levels.

5. Lack of Financial Assistance for Unemployed Non-Native[28] Alaskans in Need of Vocational Training

Unemployed and economically disadvantaged Alaskans often need financial assistance if they are to take advantage of vocational training opportunities. Such financial aid is available for Native Alaskans through such sources as the Bureau of Indian Affairs Employment Assistance Program and the CETA funds of the thirteen Title III Native prime sponsors. However, the largest number of economically disadvantaged and unemployed Alaskans are non-Native (see Table 17). These non-Natives in Alaska are not being equitably served by CETA programs. They have few other sources of financial assistance for job training.

Table 17

Estimate of Alaska's Economically Disadvantaged Population by Ethnic Status: 1978

	Estimated Total Population	Estimated Economically Disadvantaged Population	Est. Nos. CETA Served FY78	Proportion Economically Disadvantaged CETA Served
White	325,282	32,835	3,143	10%
Ak. Native	54,405	26,822	10,831	40
Black	20,067	4,676	487	10
Other	6,913	1,148	222	13
Total	406,667	65,481	14,683	23%

SOURCE: Institute of Social and Economic Research estimates prepared for State Manpower Services Council, 1978, on the basis of the Survey of Income and Education, 1975.

Lack of financial assistance for vocational students was a problem stressed by 50 percent of those vocational institutions that mentioned barriers in the use of their programs (Table 18). As one community college emphasized:

> The biggest problem is students who are recently on their own. They cannot afford tuition and cannot get financial aid because parents still claim them on their income tax.

Vocational students in community colleges have access to six types of financial aid:

Federally Sponsored Sources

1. Supplemental Education Opportunity Grant.
2. National Direct Student Loan.
3. Work-Study.
4. Guaranteed Student Loan.
5. Basic Education Opportunity Grant.

State Sponsored Sources

6. Alaska Student Loan Program.

However, the first three financial assistance programs have very limited funds and are usually out of money for the following school year by early summer. As one financial aids officer explained:

> Financial aid has not been so scarce on Alaskan campuses for many, many years. During the pipeline, more jobs were available and fewer people were in school. We weren't able to utilize our funds so we were cut back. I tried to explain the situation to Region X but they just cut us according to the under-utilization formula.

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[26] *Ibid.*

[27] The student survey developed through this project contains questions on educational plans and can be used to examine student intentions in completing different programs.

[28] Meaning not Eskimo, Aleut, or Athabascan Indian.

Vocational students are eligible for the Alaska Student Loan Program. The Alaska employment forgiveness aspect of this program makes this source especially valuable for students seeking employment. However, the Alaska Student Loan Program depleted its 1979-80 fund allocation in August 1978. An unemployed individual usually needs financial assistance right away and cannot wait to put in an application for the next year's funding cycle.

RECOMMENDATION: The Alaska Commission on Postsecondary Education should set aside a proportion of Alaska State Loan Funds for unemployed, economically disadvantaged Alaskans seeking vocational education. These special funds for the unemployed should be distributed over the course of a year rather than allocated in the summer months.

Unemployed Alaskans in need of vocational training may also have been out of school for a while and know little about funding possibilities. Community colleges refer students to the nearest University of Alaska financial aids office, and these offices may not be equipped to help students in need of vocational training.[29]

Table 18

Barriers to Vocational Program Utilization Reported by Postsecondary Vocational Institutions

Insufficient financial aid	50%
Lack of counseling, dormitory, and other support services	21
Better preparation for program	14
Lack of information on program	14
Centralized location	14
Other	14

Number of Institutions[a] = 14

[a] No barriers were brought up by eighteen of the total number of programs interviewed. However, ten of those were apprenticeship programs.

SOURCE: "Survey of Alaskan Postsecondary Vocational Institutions" (Fairbanks: Institute of Social and Economic Research, University of Alaska, 1978).

RECOMMENDATION: Vocational institutions should inform students directly about available sources of financial aid. Schools should also explore other strategies for helping students acquire funds, for example, by seeking special industry scholarships through advisory councils and using cooperative programs as a financial aid mechanism.

CONCLUSION

The problems in Alaska's vocational education system are not fundamental matters requiring major overhauls of existing programs, large expenditures of new funds, or the creation of new institutions. They are primarily problems in the fine tuning of the system. Many of the recommendations made in this report require more the redirection of current activities than new financial expenditures. They are matters of clearer planning and modest changes in the present efforts of vocational education and manpower personnel. Table 19 (see pages 26 and 27) summarizes these recommendations and relevant action steps. Small changes, however, can make large differences to the success of Alaska's vocational education enterprise.

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[29] The second listed author of this study contacted one University of Alaska financial aid officer, posing as an unemployed person in need of aid and asked:

"Do you have deferred tuition?"

"Only in certain instances."

"What are those instances?"

"VA, pending loan, or some form of assurance that we will be paid back."

"You mean you don't have any routine system for deferred tuition?"

"What's your circumstance?"

"I'm unemployed and would like to be able to go to school next semester and I don't have the money to pay tuition right now."

"Oh, there's really not a whole lot we can do about it."

"Ok, thank you."

Table 19

Summary of Recommendations and Estimated Costs

Problem Area	Requires Redirection of Current Effort	Requires Initial Development Effort (Estimation)	Requires Additional Operating Funds (Estimation)
1. Confusion About the Relevant Goals of Vocational Education in Alaska			
RECOMMENDATION 1: Vocational educators should determine what type of program goals are appropriate for their communities and student populations. These goals should guide decisions about program content, planning and evaluation methods, and funding priorities.	X	Assessment of AK goal alternatives for vocational ed; $25,000	(—)*
2. Lack of Information on the Alaska Labor Market			
RECOMMENDATION 2: The Alaska Occupational Information Coordinating Committee (AOICC), an agency set up under the Vocational Education Amendments of 1976 specifically to deal with the problem of making available occupational information for statewide planning, should make the development of useful Alaska labor market information its first priority.	X	Model local employer survey $40,000	(—)
RECOMMENDATION 3: The Research and Analysis Section of the Alaska Department of Labor should improve the presentation of Alaska labor market information in its current publications. Regional labor market information should also be provided through carefully done descriptive reports from local manpower offices.	X		Staff work Research and Analysis, Dept. of Labor $30,000
RECOMMENDATION 4: Vocational education institutions should delegate formal responsibility for labor market analysis to a staff member. This staff member should become knowledgeable in how to conduct local employer surveys and in how to use and interpret diverse sources of labor market information.	X		Vocational staff development activities $35,000
3. Lack of Attention to Job Placement and Job Development			
RECOMMENDATION 5: Job placement and job development activities should be an essential component of Alaska vocational education programs which have job preparation goals. Specific vocational education funds should be allocated for placement activities.	X		Instruction release time job placement $10,000-$40,000 per voc ed institution;
RECOMMENDATION 6: The Alaska Department of Education should assign to specific vocational education staff the role of assisting all public vocational institutions with job development activities and also of coordinating vocational education program planning.	X		Statewide job developer position $40,000
RECOMMENDATION 7: Alaska vocational institutions should incorporate cooperative programs as much as possible into their educational programs and use cooperative education as a job placement strategy.	X		
4. Low Numbers of Graduates			
RECOMMENDATION 8: Vocational educators should calculate completion rates in different program areas, determine the causes of low rates, and inform students about their position in the job market at varying skill levels.	X	Model internal vocational evaluation system $40,000	(—)

Table 19 (cont.)

Problem Area	Requires Re-direction of Current Effort	Requires Initial Development Effort (Estimation)	Requires Additional Operating Funds (Estimation)
5. Lack of Financial Assistance for Unemployed Non-Native Alaskans in Need of Vocational Training			
RECOMMENDATION 9: The Alaska Commission on Postsecondary Education should set aside a proportion of Alaska State Loan Funds for unemployed, economically disadvantaged Alaskans seeking vocational education. These special funds for the unemployed should be distributed over the course of a year rather than allocated in the summer months.	X		
RECOMMENDATION 10: Vocational institutions should inform students directly about available sources of financial aid. Schools should also explore other strategies for helping students acquire funds, for example, seeking special industry scholarships through advisory councils and using cooperative programs as a financial aid mechanism.	X		

*Dependent upon outcome of development effort.

APPENDIX: Methods

Scope of Study

This study surveyed Alaskan postsecondary institutions offering vocational education programs in 1978. Postsecondary institutions were defined as those serving persons 16 years of age or older who had graduated from or left elementary or secondary school.[1] Vocational education was defined as programs "which are directly related to the preparation of individuals for paid or unpaid employment or for additional preparation for a career requiring other than a baccalaureate or advanced degree."[2] Thus, this study did not include single vocational courses, such as a typing course offered by a University of Alaska extension center. Nor did it include special job training programs funded under short-term grants or training programs offered by agencies, primarily as in-service education. The study focused on established vocational programs offered by postsecondary educational institutions.

High school vocational programs were not examined in detail because the primary function of many programs is practical education, not job preparation.[3] Secondary school vocational programs emphasize such fields as home economics or woodworking.[4] Rural high schools particularly are developing vocational programs in locally relevant practical areas, such as sled building and greenhouse science. High school programs also provide introductory courses in occupational areas, such as auto mechanics or drafting. However, students generally need more advanced occupational training for these skills to help them substantially in the job market.

An important exception is high school business education and office programs where high school graduates can qualify for many clerical positions. In 1978, these programs enrolled almost 9,900 students and accounted for 40 percent of the total secondary school enrollment in vocational education (Table A-1). The prevalence of high school clerical programs, along with the twelve postsecondary secretarial programs operating in Alaska, may be contributing to an oversupply of clerical workers in some areas of Alaska.

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[1] The definitions of "postsecondary" and "vocational education programs" are based on definitions in the *Alaska Five-Year Plan for Vocational Education FY '78-82* (Juneau: Department of Education, 1978).

[2] *Ibid.*, p. 275. This definition is consistent with the national definition used by the National Center for Education Statistics. In their *Survey of Programs and Enrollments—Postsecondary Schools*, a vocational education program is defined as "a planned sequence of courses leading to a specific occupational skill such as secretarial science, ornamental horticulture, or body and fender repair. Programs which do not lead to careers should be excluded, such as food preparation for housewives, private pilot training, or charm courses.

[3] Job preparation is the assumed goal of vocational education. See above definition. As this study suggests, however, many postsecondary vocational programs also emphasize practical education.

[4] For a detailed summary of secondary school vocational programs, see Gene Walsh, *An Identification of Vocational Education/Training Activity in Alaska for Fiscal Year 1978*, prepared for the Alaska State Advisory Council on Vocational and Career Education and State Manpower Services Council 1978.

Identification of Vocational Postsecondary Schools

Postsecondary institutions offering vocational programs were identified through the Alaska Commission on Postsecondary Education's 1977-78 *Directory of Postsecondary Educational Institutions in Alaska.* This directory includes institutions licensed in the State of Alaska as of August 1977.[5] Of the thirty-nine institutions included in this group, 79 percent were interviewed. In addition, we obtained basic information on programs and enrollments on the flight schools and other private schools not included in the interview study through "Survey of Programs and Enrollments—Postsecondary Schools" data, collected by the Alaska Commission on Postsecondary Education as part of the program of the National Center for Educational Statistics. We obtained information on apprenticeship program enrollments and student characteristics through the Bureau of Apprenticeship Training.

Table A-1

Statewide High School Enrollments in Vocational Education and Work Experience Programs

(First Quarter 1977-78 School Year)

Program Areas	Enrollment	Proportion of Enrollment
Vocational Education		
Business Education & Office	9,900	40%
Industrial Education & Trade and Industry	9,391	38
Home Economics & Consumer & Homemaking	4,367	18
Agriculture	302	1
Vocationally Handicapped	23	(.1)
Special Education Courses	49	(.2)
Other	647	3
TOTAL[a]	24 679	100%
Work Experience		
Cooperative and/or Work-Experience	1,614	43%
Special Vocational Education & Work Study[b]	1 452	38
Rural Student Vocational Participants[c]	704	19
TOTAL	3 770	100%

[a]This is not an unduplicated count as some students may be enrolled in more than one program.

[b]Enrollments as of May 11, 1978.

[c]1977-78 school year totals.

SOURCE: Gene Walsh, *An Identification of Vocational Education/Training Activity in Alaska for Fiscal Year 1978.* Prepared for the Alaska State Advisory Council on Vocational and Career Education and State Manpower Services Council, 1978, pp. 4-5. (Minor changes made in format.)

Interview with Vocational Postsecondary School Administrators

The first section of the interview covered institution-wide issues such as entrance and tuition requirements, enrollment and graduation rates, age, sex, and ethnic characteristics of students, and institutional goals, problems, and information needs. For each vocational program area that the school offered, basic information was collected on numbers and characteristics of students and graduates.

To relate vocational programs to labor market demand, we used the *Dictionary of Occupational Titles* to identify the occupations for which each vocational program prepared students. These occupations were checked for accuracy with each institution.[6]

An interview form was developed for each school, listing its vocational programs, the occupations we had tentatively identified, and other information about the school available from secondary sources. The interview form was sent to each institution with a letter stating the date on which we would telephone them to update or correct information presently on the forms and to complete the remainder of the survey.

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[5] Of the postsecondary vocational education institutions listed in this directory, our study included all but the flight schools, H & R Block, the Bible colleges, and the Department of Public Safety Training Academy. These schools were excluded because they were seen as having limited impact on supply and demand in Alaska's labor market. The Department of Public Safety Training Academy offers in-service training. The flight schools are involved in training in large part for recreational and private business purposes. H & R Block is supplementary education. The Bible colleges provide training not traditionally subjected to supply and demand analysis.

[6] A separate publication, intended for use by manpower planners and school guidance counselors, lists postsecondary vocational programs and the occupations for which they prepare students. A section defining these occupations is included as well. See Lynn Wright, *Postsecondary Vocational Training in Alaska* (Fairbanks: Institute of Social and Economic Research, 1978).

Interviews were conducted primarily with the presidents of the community colleges, the owners of private schools, and the coordinators of apprenticeship programs. In many cases, these administrators had relied on staff to obtain specific information. The interviews ranged from 1 to 3 hours. Telephone calls were repeated as needed to obtain the required data.

Exploratory Study of Fairbanks Vocational Students' Motivations and Goals

As this study proceeded, it became apparent that a major problem area was confusion about the goals of vocational education students. Were students enrolling in the vocational education programs to prepare for the job market or to acquire practical skills? Similarly, there was lack of information on the communities where vocational students planned to look for jobs. Vocational planning was generally based on the needs of the local labor market, whereas students might plan to look for jobs in other communities.

To develop some information on the goals of vocational students that could be used to address such planning issues, we conducted a survey of vocational students in the public sector in Fairbanks. This study included 238 students, a sample of 50 percent of the adult student enrollment at the Hutchison Career Center, and 33 percent of the enrollment at the Tanana Valley Community College. The interview concerned such topics as students' educational and occupational goals, motivations for enrolling in vocational programs, plans to enter the labor market, and problems and needs. This survey was developed for Fairbanks institutions but can be adapted to the needs of other vocational schools. A copy can be obtained from Dr. Judith Kleinfeld, Institute of Social and Economic Research.

Limitations of Study

A major limitation of this study was the poor information available in the community college system, the largest provider of vocational programs. While these institutions have data on the total number of students in the school, they cannot routinely determine the number and characteristics of individual students enrolled in their vocational education programs. In order to arrive at some reasonable estimation of vocational program enrollments, we used estimating techniques. Use of estimating devices, as well as missing information from some institutions, leads to minor discrepancies in different tables.

The use of telephone interviews with administrators, while substantially less costly than personal travel, also limits the amount and quality of information obtained. Most administrators appeared to be open in discussing program problems. However, it was not possible to check their accounts through on-site observations or discussions with teachers and students. Nor was it possible to discuss vocational programs with individual program heads or instructors, whose knowledge is much more detailed than that of administrators.

BOOK REVIEWS

Eskimos of Northwestern Alaska: A Biological Perspective. **Edited by Paul L. Jamison, Stephen L. Zegura, and Frederick A. Milan, Dowden, Hutchinson and Ross, Inc., Stroudsburg, 1978, 319 pp., illustrations, references, index, appendices (no price information given).**

This is an compilation of biological, linguistic, ethnohistorical, anthropometric, nutritional, psychological, health, and demographic research among Eskimos of Wainwright, Barrow, Point Hope, Kaktovik, and Anaktuvuk Pass, during the years 1968 through 1972. The work was done as part of The International Biological Program and includes a chronology of fieldwork.

It would take a lengthy review indeed to summarize the findings of the twenty-two studies presented here by the thirty-eight scholars involved. Even the editors find this task nearly beyond them, although a final chapter attempts to summarize the essentially biological works.

Briefly, the researchers find that while diet has changed, there seems to be little evidence that it is nutritionally inadequate except for iron intake. However, no clinical evidence of *any* problem relating to diet deficiency could be found.

Eskimos do seem to show more rapid bone loss of mineral content than non-Eskimos, to have greater vital capacity (essentially lung capacity), and some degree of lactose intolerance (common among people not traditionally users of dairy products). Eskimo physical growth rates were found to be both slower than a non-Eskimo control group and to end earlier, though body weight seems higher at all ages. Historically, there seems to have been a substantial increase in size. In addition, there is a cognitive "slump" for Eskimo teenagers, and basic Piagetian* developmental theory seems supported by Eskimo data. Eskimos tend to age (decline physically) more rapidly than non-Eskimo control groups.

This reviewer's greatest familiarity is with acculturation, social and psychological aspects of Eskimo life, demography, and, to a lesser extent, with nutritional studies. Based upon this, I suggest psychological studies in the volume are quite conservative in findings and guarded in implications. The demographic and nutritional work seems to be solid and acceptable, both in its approach and findings, though the demographic work makes use of only the most limited explanatory variables. This is not meant as a criticism, but merely to explicate what seems to be a guiding element of the entire volume. After their data accumulation, compilation, and organization, both researchers and editors appear to be far more comfortable with limited and conservative, rather than with wide-ranging, analysis.

Overall, the book should prove to be clearly useful, not only to those generally or professionally interested in Eskimos but also to those concerned with comparative studies of biology of populations. It is especially useful in outlining a number of biological problems in need of further research.

The Far North—2000 Years of American Eskimo and Indian Art, **by Henry B. Collins, Frederica DeLaguna, Edmund Carpenter, and Peter Stone. Indiana University Press, Bloomington, Indiana, 1977, 289 pp., 15 color plates (including frontispiece), 366 black and white plates, maps, references (no index), slick paperback, $14.95, cloth, $22.50.**

One of the most impressive works on the art of the Alaska Native this reviewer has ever seen. Of high scholarly quality, beautifully and clearly illustrated, it is nonetheless organized along lines simple enough to be enjoyable to the amateur.

Narrative information identifies many cultural artifacts of unusual artistic merit and by describing the origin and use of items, it makes the artistic beauty of the objects even more obvious. The work is divided into sections dealing with Eskimos, Athabascan and Tlingit (including Haida) art. Eskimo art is discussed further in the context of archeological findings, and culture sequences over the last two thousand years.

It is easy to make comparisons between the art of these different groups thanks to this interesting organizing scheme, and the narrative helps. Marred only by a tendency toward romanticism in some of the narrative, it is nonetheless a book of wide general appeal and interest.

Arthur E. Hippler

★ ★ ★ ★

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*A theory stating that perceptual and cognitive abilities occur in expectable sequences and more or less on schedule.

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The Institute of Social and Economic Research was established in 1961 for the purpose of conducting interdisciplinary research in the social sciences and related fields. The institute is part of the University of Alaska and has branches in Anchorage, Fairbanks, and Juneau. In addition to the *Alaska Review of Social and Economic Conditions*, the institute publishes ISER *Reports, Occasional Papers, Research Notes*, and other special publications. Recent institute publications include:

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ALASKA

REVIEW OF

SOCIAL AND ECONOMIC

CONDITIONS

UNIVERSITY OF ALASKA, INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH, APRIL 1980, Vol. XVII, No. 1

PROSPECTS FOR A BOTTOMFISH INDUSTRY IN ALASKA

Preparation of this report was made possible in large part by financial support provided by the House Finance Committee of the Alaska Legislature

PART I. BACKGROUND

The Alaska fishing industry may have a chance to develop a whole new resource as a result of the Fisheries Management and Conservation Act of 1976, popularly known as the "200-mile limit" law. This legislation established a 200-mile fisheries conservation zone off the coast of the United States, and within this zone, U.S. fishermen and fish processors have preferential rights to exploit each individual fish stock. One group of such stocks is loosely termed "bottomfish." If the U.S. fishermen and processors develop a capability of harvesting and processing bottomfish, the law will exclude foreign fishermen to the extent that U.S. fishermen are capable of replacing them. As a result, it is hoped that what has historically been a large-volume foreign fishery will become a U.S. fishery, creating jobs and income in the United States and particularly in Alaska.

The creation of such a U.S. fishery, however, will require more than preferential access to the resource. It will also require: (1) markets that are willing to take the U.S. catch, (2) product prices high enough (and costs low enough) to make fishing for these species attractive to fishermen and processors, and (3) willingness of capital markets and federal, state, and local governments to develop the fishery, based on calculations of whether the supposed benefits and risks will be worth the cost.

This *Review* summarizes current knowledge on the development of the Alaska bottomfish resource, as follows:

- Part I provides an overview of the resources, harvesting methods, and the history of foreign and domestic participation. Against this background it then discusses the first key requirement for development of a bottomfish industry: potential markets.
- Part II addresses the commercial feasibility of the Alaska bottomfish industry from both harvesting and processing viewpoints. It focuses on a small group of key operating variables that determine prices and costs, and which, in this case, make the industry's prospects questionable.
- Part III considers some of the impacts of large-scale bottomfish industry development on Alaska's employment, income, and state and local government revenues.
- Part IV discusses the community infrastructure expenditures required to support the bottomfish industry. It also describes the main sources of funds which could be used to support new private and public investment in the harvesting and processing sectors, as well as in the community infrastructure.
- Part V presents major conclusions arising from the study and an overview of the prospects of bottomfish industry in Alaska.

See Table of Contents, page 2

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FEATURE

Michael J. Scott 1 Prospects for a Bottomfish Industry in Alaska

BOOK REVIEWS

Arthur E. Hippler 32 *Peoples of the Coast. The Indians of the Pacific Northwest*, by George Woodcock.

Eskimos and Explorers, by Wendell H. Oswalt.

Michael J. Scott was an assistant professor of economics with the Institute of Social and Economic Research at the time of this writing; he has since accepted a position with Battelle Northwest Laboratories in Richland, Washington. Arthur E. Hippler is an associate professor of anthropology working out of the institute's Anchorage office.

The Resource

What are Bottomfish?

Bottomfish is a rather loose, inaccurate term used to collectively describe several low-valued species of fin fish caught in Alaskan waters. Overlapping terms are groundfish, whitefish, demersal species, or underutilized species. Generally, these terms refer to several stocks of midwater-to-bottom-dwelling fin fish which are currently not heavily harvested by American fishermen. Although Americans have participated in commercial fisheries for some of the more valuable bottom-dwelling species such as halibut and sablefish since 1867, halibut are usually excluded in discussions of the new industry, since this fishery is considered to be both high-value and fully exploited. Thus, in Alaskan waters, the term "bottomfish" primarily applies to sablefish (black cod), Pacific cod (true or gray cod); flounder, sole, and other flatfish (except halibut); Pacific Ocean perch and other rockfish (also known as rock cod and sea bass); Atka mackeral (a member of the greenling family); Alaska pollock, and miscellaneous other species of lesser commercial importance.

Distribution and Maximum Sustained Yield

Table 1 shows the general geographic distribution of major Alaska bottomfish stocks. The maximum sustained yield (MSY) shown in the table is the biologists' best estimate of the range of the largest possible weight which commercial and recreational fishermen can take annually under existing environmental conditions. Equilibrium yield (EY) is the annual or seasonal harvest which maintains the resource at approximately its current level of abundance (apart from effects of environmental variation) over a number of seasons or years. Finally, fishery managers may set allowable biological catch (ABC) at

Table 1

Alaska's Potential Bottomfish Resources[a]

(1,000 metric tons)

			Bering Sea/Aleutian Area[b]			Gulf of Alaska[c]		
Species	SubArea[d]		Est. MSY	Est. EY	ABC	Est. MSY	Est. EY	ABC
Sablefish (Black cod)	BS		11.35	3.5	3.5	--	--	--
	AL		1.85	1.5	1.5	--	--	--
		Total	13.20	5.0	5.0	22-25	17.4-19.8	17.4
Yellowfin sole	--		169-260	117	117			
Turbots (Arrowtooth, Flounder, & Greenland Turbot)	--		100	90-95	90	67	N/A	67.0
Other Flatfishes	--		44.3-76.8	43.3-76.8	61			
Pacific Cod (true or grey cod)	--		58.7	58.7	58.7	88-177	N/A	60.0
Pacific Ocean Perch	BS		75[e]	6.5[f]	6.5[e]	--	--	--
	AL		32[e]	15[e]	15[e]	--	--	--
		Total	107	21.5	21.5	125-150	50	50.0
Other Rockfishes	BS		N/A	N/A	N/A	--	--	--
	AL		N/A	N/A	N/A	--	--	--
		Total	N/A	N/A	N/A	11.35-13.75	N/A	11.35
Pacific Pollock	--		1,100-1,600	1,000	1,000	169-338	N/A	168.8
Other	--		67	67	55.5	13.2	N/A	29.4
TOTAL			1,659.2-2,82.7	1,403.5-1,441.0	1,408.7	495.55-783.95	N/A	403.95

[a] Excludes Halibut.

[b] "Summary and Draft Environmental Impact Statement for the Groundfish Fishery in the Bering Sea/Aleutian Island Area," Volume II, North Pacific Fishery Management Council, July 27, 1978.

[c] "Gulf of Alaska Fishery Management Plan," Amendments to. (n.d.) North Pacific Fishery Management Council, April 21, 1978.

[d] BS = Eastern Bering Sea Area (INPFC Statistical Areas, I, II, III, combined), AL = Aleutian Area.

[e] Includes other rockfish.

[f] Pacific perch only.

a level different from EY to account for fluctuations in the size of the stock or to rebuild depleted stocks. ABC thus represents the current harvestable stock that is relevant to commercial and recreational fishing. The fish stock statistics are related to the regulatory areas shown in Figure 1a. The most recent boundaries are shown in Figure 1b.

To put the numbers in Table 1 in perspective, the world 1977 commercial catch of cod-like fishes (including pollock), redfish (and other species similar to ocean perch), flounders, and flatfish, totaled about 17 million metric tons,[1] about 5.5 times the estimated high-range maximum sustained yield of all Alaskan waters for these species. Alaska, if fully developed, would thus represent about 18 percent of world catch. The high-range maximum sustained yield is also about equal to the 1977 U.S. catch of 3.1 million metric tons of all species (including bottomfish) combined; thus, full development would result in a doubling of the U.S. catch, though not a doubling of value caught because of the low value of bottomfish (as compared to salmon, crab, tuna, etc.). Highest development would increase 1978 Alaska commercial landings tenfold.

Table 1 indicates that the total physical abundance of the bottomfish stocks is much greater in the

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[1] A metric ton equals 1,000 kilograms, or 2,204.6 pounds, as opposed to the U.S. short ton of 2,000 pounds.

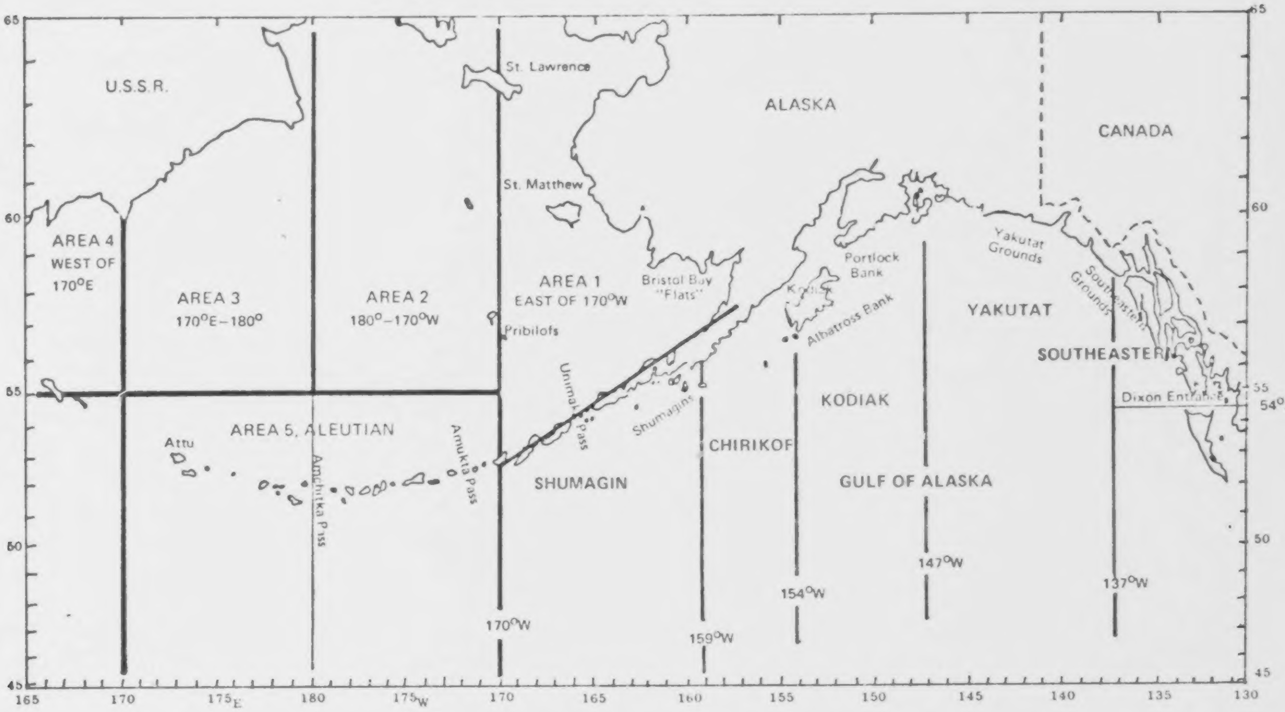
U.S.S.R.
ALASKA
CANADA
St. Lawrence
St. Matthew
AREA 4 WEST OF 170°E
AREA 3 170°E–180°
AREA 2 180°–170°W
AREA 1 EAST OF 170°W
Bristol Bay "Flats"
Pribilofs
Portlock Bank
Kodiak
Albatross Bank
Yakutat Grounds
Southeastern Grounds
YAKUTAT
SOUTHEASTERN
Dixon Entrance
54°30'N
KODIAK
CHIRIKOF
SHUMAGIN
GULF OF ALASKA
AREA 5, ALEUTIAN
Attu
Amchitka Pass
Amukta Pass
Unimak Pass
Shumagins
170°W
159°W
154°W
147°W
137°W
65
60
55
50
45
165
170
175E
180
175W
170
165
160
155
150
145
140
135
130

Figure 1A. International North Pacific Fisheries Commission Statistical Areas

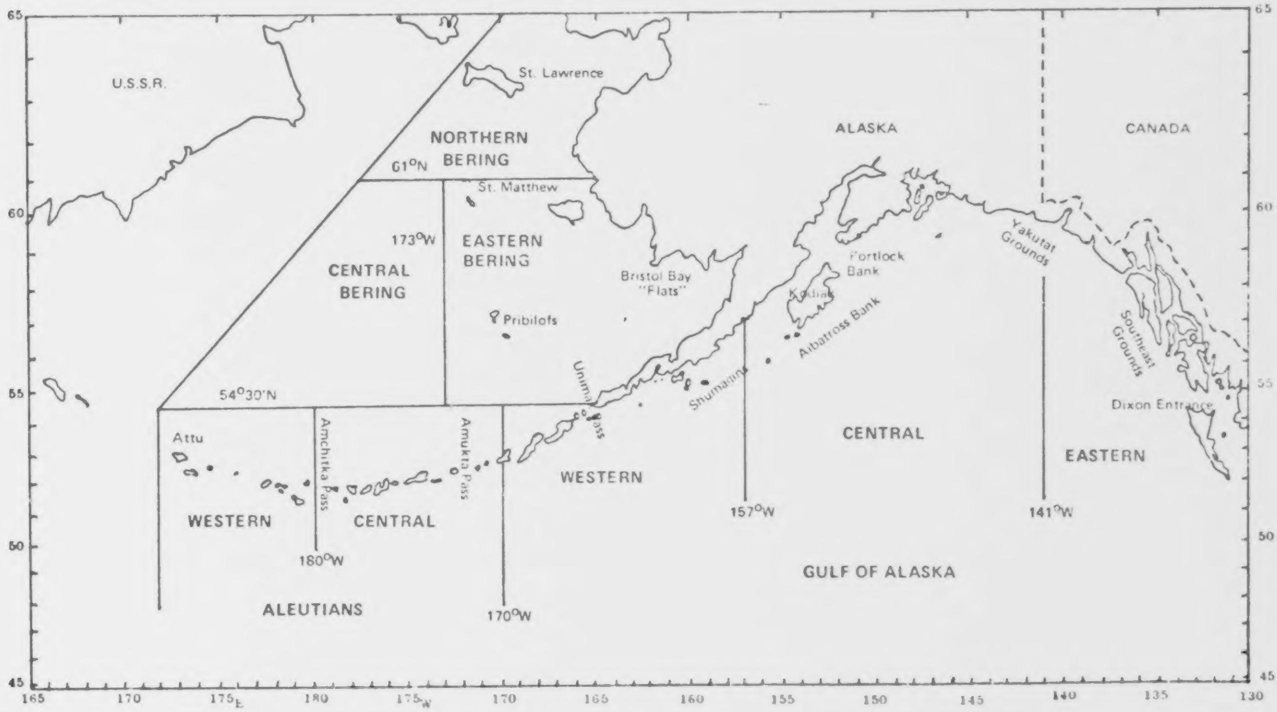
U.S.S.R.
ALASKA
CANADA
St. Lawrence
NORTHERN BERING
61°N
St. Matthew
173°W
CENTRAL BERING
EASTERN BERING
Bristol Bay "Flats"
Pribilofs
Portlock Bank
Kodiak
Albatross Bank
Yakutat Grounds
Southeast Grounds
Dixon Entrance
54°30'N
Attu
Amchitka Pass
Amukta Pass
Unimak Pass
Shumagins
WESTERN
CENTRAL
ALEUTIANS
180°W
170°W
WESTERN
CENTRAL
EASTERN
157°W
141°W
GULF OF ALASKA
65
60
55
50
45
165
170
175E
180
175W
170
165
160
155
150
145
140
135
130

Figure 1B. North Pacific Fisheries Management Council Statistical Areas

Bering Sea than in the Gulf of Alaska. For example, the estimated equilibrium yield of pollock alone in the Bering Sea is estimated at 1.5 to 2.5 times the yield for all commercially significant ground fish in the Gulf of Alaska. On the other hand, the currently more valuable species such as Pacific Ocean perch, Pacific cod, and sablefish appear to be more abundant in the Gulf of Alaska, and may be concentrated at the eastern end of the Gulf where the total biomass is smallest. Thus, in spite of the greater abundance of bottomfish in the Bering Sea, the chances for an American bottomfish industry may be best in the Gulf of Alaska, where the more valuable species are located. However, the information on general abundance depicted in Table 1 is of little use to the fisherman deciding whether or not to go fishing. More critical information concerns when and where within these larger areas the relevant species concentrate and can be more easily caught. Although there are some public data available on historical foreign catch by month for smaller geographic areas than those shown in the table, the monthly pattern for specific areas is not consistent across years. One of the most difficult challenges faced by American skippers is that of acquiring sufficient knowledge about the bottomfish stocks' behavior to make their fishing consistently and profitably productive.

Harvesting Methods

Longline (setline). There are two major methods being used to harvest bottomfish by American and foreign fleets, trawl and longline (setline), with small amounts of catch being recorded for other types of gear such as pots and seiners. The longline fishery is primarily targeted on sablefish and mostly includes vessels from the United States, Japan, and Republic of Korea, although Canada and Taiwan also participate. Longline gear consists of several 300-fathom (1,800 feet) lengths of fishing line spliced end-to-end, with branch lines (each having a single baited hook) at regular intervals. The gear is usually left on the ocean bottom from 4-to-30 hours and is then retrieved. Fishing is usually conducted at depths between 45 and 150 fathoms but may be as deep as 300 fathoms or as shallow as 15 fathoms. United States longline vessels are mainly halibut boats which fish the inside waters of Southeast Alaska after the halibut season. Most are 34-to-50 feet in length, with capacity of about 15-to-30 net tons. The much larger Japanese and Korean longline vessels average about 500 net tons and tend to fish the outside waters of the Gulf, the Aleutians, and the Bering Sea.

Trawling. Trawling is the chief method employed on bottomfish other than sablefish. The basic gear in the trawl fishery is a large, conical net which is towed (usually near the ocean bottom) through an area where a school of fish has been identified or suspected. As the net is towed, it captures any fish in its path which are too slow to escape. The net is hauled aboard at regular intervals, emptied, and the fish sorted, processed, and stored. Historically, the U.S.-based trawl vessels have been primarily Kodiak shrimp trawlers of 65-to-90 feet, which range from 27-to-150 net tons capacity and carry a crew of about five. These vessels do not have processing capabilities on board. The Soviet fleet has historically been a mix of larger side trawlers (which shoot and recover their nets over the side) and factory stern trawlers. The former are divided into three classes, ranging from 265 gross registered tons and a crew of twenty-two up to 700 gross registered tons and a crew of thirty. The largest class of these vessels often processes their own catch but may also offload onto factory ships. Soviet factory stern trawlers are about 3,170 gross tons and carry a crew of 90. New "super trawlers" have been scheduled for production, and these are 4,000-to-5,000 gross tons. Refrigerated transports and other service vessels allow the fleet to remain on the fishing grounds almost indefinitely. Soviet factory ships and side trawlers have been largely phased out in Alaskan waters. The Japanese, Poles, Koreans, and Taiwanese all use factory stern trawlers, having abandoned side trawlers. The Japanese and Koreans also pair trawl—use two fishing boats to drag a single trawl net. These vessels deliver their catch to motherships of 5,000-to-10,000 gross tons. Pair trawling is the primary method of harvesting fish for the frozen-fish, minced-fish, and fish-meal trade of the Bering Sea.

Comparison of Foreign and Domestic Participation

General

In spite of Americans having had the first commercial bottomfish fishery in Alaska waters, foreign nations (particularly Japan and the U.S.S.R.) have caught the overwhelming bulk of bottomfish taken off Alaska. Americans (and Canadians) have concentrated on halibut. Table 2 shows the bottomfish catch by country from International North Pacific Fisheries Commission statistical areas (map: See Figure 1a). Clearly, Japan has been the dominant nation, both in the Gulf of Alaska and in the Bering Sea, harvesting more than three times the bottomfish of its next nearest competitor, the U.S.S.R. Japan began fishing commercially in the Bering Sea in 1954 and began diverting trawlers to the Gulf of Alaska on an explora-

Table 2

Catches (Approximate) of Bottomfish (excluding Halibut) Off Alaska by Country and Area of Catch, 1970-1978
(1,000 metric tons round weight)

	Japan	U.S.S.R.	S. Korea	Other Foreign Countries	U.S.	Total	Area Distribution Percent
1970							
Bering Sea, Aleutians	1,480	232	5	––	––	1,717	94.8
Shumagin	8	2	––	––	––	10	0.5
Chirikof	9	2	––	––	––	11	0.6
Kodiak	20	5	––	––	––	25	1.4
Yakutat	21	a	––	––	––	21	1.2
Southeastern	27	––	––	––	––	27	1.5
Total	1,565	241[b]	5	––	––	1,811	100.0
Percent	86.4	13.3	0.3			100.0	
1971							
Bering Sea, Aleutians	1,806	397	10	––	––	2,213	94.8
Shumagin	10	8	––	––	––	18	0.8
Chirikof	8	5	––	––	––	13	0.6
Kodiak	23	17	––	––	––	40	1.7
Yakutat	23	1	––	––	––	24	1.0
Southeastern	24	––	––	1	1	26	1.1
Total	1,894	428[b]	10	1	1	2,334	100.0
Percent	81.2	18.3	0.4	a	a	100.0	
1972							
Bering Sea, Aleutians	1,917	412	9	––	––	2,338	92.7
Shumagin	16	17	1	––	––	34	1.4
Chirikof	7	12	––	––	––	19	0.7
Kodiak	26	37	––	––	––	63	2.5
Yakutat	30	3	––	––	––	33	1.3
Southeastern	33	––	––	1	1	35	1.4
Total	2,029	481[b]	10[c]	1	1	2,522	100.0
Percent	80.5	19.1	0.4	a	a	100.0	
1973							
Bering Sea, Aleutians	1,755	348	7	––	––	2,110	92.1
Shumagin	10	14	3	––	––	27	1.2
Chirikof	15	16	––	––	––	31	1.3
Kodiak	25	28	––	––	––	53	2.3
Yakutat	35	4	––	––	––	39	1.7
Southeastern	29	––	1	––	1	31	1.4
Total	1,869	410	11[c]	––	1	2,291	100.0
Percent	81.6	17.9	0.5		a	100.0	
1974							
Bering Sea, Aleutians	1,574	436	34	––	––	2,044	91.9
Shumagin	12	20	3	––	––	35	1.6
Chirikof	15	8	––	––	––	23	1.0
Kodiak	31	46	––	––	––	77	3.5
Yakutat	19	3	––	––	––	22	1.0
Southeastern	19	––	3	––	––	22	1.0
Total	1,670[d]	513	40[c]	––	––	2,223	100.0
Percent	75.1	23.1	1.8			100.0	
1975							
Bering Sea, Aleutians	1,276	338	5	a	a	1,619	88.9
Gulf of Alaska	90	95	14	2	1	202	11.1
Total	1,366	95	14	2	1	1,821	100.0
Percent	75.0	23.8	1.0	0.1	0.1	100.0	
1976							
Bering Sea, Aleutians	1,168	280	83	a	––	1,531	87.4
Gulf of Alaska	93	80	46	a	2	221	12.6
Total	1,261	360	129	a	2	1,752	100.0
Percent	72.0	20.5	7.4	a	0.1	100.0	
1977							
Bering Sea, Aleutians	1,107	106	48	1	––	1,262	86.2
Schumagin	26	14	35	––	––	75	5.1
Chirikof	16	13	2	––	––	31	2.1
Kodiak	21	36	1	2	1	61	4.2
Yakutat	19	a	a	––	––	19	1.3
Southeastern	14	a	a	––	2	16	1.1
Total	1,203	169	86	3	3	1,464	100.0
Percent	82.2	11.5	5.9	0.2	0.2	100.0	

(continued on next page)

Table 2 (continued)

	Japan	U.S.S.R.	S. Korea	Other Foreign Countries	U.S.	Total	Area Distribution Percent
1978							
Bering Sea, Aleutians	1,082	215	68	3	--	1,368	89.2
Shumagin	13	2	33	--	--	48	3.1
Chirikof	14	56	1	--	--	71	4.6
Kodiak	23	4	a	1	1	28	1.8
Yakutat	11	a	a	--	--	11	0.7
Southeastern	5	a	a	--	3	8	0.5
Total	1,148	277	102	3	4	1,534	99.9
Percent	74.8	18.1	6.6	0.2	0.3	100.0	

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[a] Less than 500 tons or 0.05 percent.

[b] Sources give U.S.S.R. catch for "Gulf of Alaska" only. Allocation to International North Pacific Fisheries Commission areas calculated on basis of 1973 and 1974 distributions.

[c] Sources give South Korea catch for "Gulf of Alaska" only. Allocation to INPFC areas calculated on basis of fleet movements reported by National Marine Fisheries Service Law Enforcement Branch.

[d] "Gulf of Alaska" catch by Japan by INPFC areas 96,000 metric tons as compared with 112,000 metric tons as reported by species.

Sources: 1970-1974 data from George W. Rogers, "Development of an Alaskan Bottomfish Industry and State Taxes," November 1977, 40 pp.
1975-1976 data from National Marine Fisheries Service.
1977-1978 foreign catch data from National Marine Fisheries Service. Domestic catch data from Alaska Department of Fish and Game.

tory basis in 1960. Japanese large-scale commercial fishing began in the Gulf in 1963, with both longline and trawl fisheries. The Soviet Union began large-scale fishing in the Bering Sea in 1959 and Gulf of Alaska operations in 1962. Korea sent exploratory trawling vessels into the Bering Sea in 1966 and began commercial operations there in 1967. They expanded their fishing into the Gulf of Alaska in 1972 with a longline fishery for sablefish. Polish trawlers appeared in the Gulf of Alaska and eastern Bering Sea in 1973, and Taiwan began to fish Bering waters and the Gulf of Alaska in 1974. Mexico also has a small fishing operation in the Gulf of Alaska.

Japan

Japanese effort was initially a mothership fishery and concentrated on flounders off Bristol Bay. However, pollock has dominated Japanese catch from the Bering Sea since 1962, and a fishery developed specifically for pollock in 1964, mostly confined to the eastern Bering Sea. In the Gulf of Alaska and Aleutians, the trawl fishery targets mainly on Pacific Ocean perch, which is the principal species caught. The Japanese longline fishery targets on sablefish.

U.S.S.R.

The Soviets have conducted three separate groundfish operations in the Bering Sea and Aleutians. The first was a flounder fishery in the southeast Bering Sea, which peaked between 1966 and 1968 and declined until 1973, when it was abandoned. The second was a Pacific Ocean perch fishery along the Aleutian Chain, which began in 1960 and which has continued sporadically until the present. Third was a pollock fishery along the outer continental shelf from Unimak Pass to the Pribilof Islands, which developed out of the flounder and black cod fishery. The Soviet pollock fishery peaked in 1974 and has since declined, but it still yields the bulk of Soviet catch. The pollock fishing vessels have recently diversified, targetting on Atka mackeral. In the Gulf of Alaska, the U.S.S.R. built up a massive fishing effort between 1962 and 1965 on Pacific Ocean perch, which yielded 200,000 metric tons in 1963 and 310,000 metric tons in 1965, falling off rapidly thereafter to 9,000 tons in 1970. The Soviets have been able to recover somewhat since then, primarily by diverting their fishing effort toward pollock, flounder, and Atka mackeral. The proportion of Soviet catch off the U.S. Pacific coast represented by the Gulf of Alaska has declined from 60 percent in 1962-65 to less than 9 percent in 1970-74.

Korea, Taiwan, Poland

Republic of Korean catches in the Gulf of Alaska were mostly sablefish until the North Pacific Fisheries Management Council imposed national quotas in 1977. Effort for sablefish in the Aleutians is considered to be larger now than a few years ago. Taiwan operates only in the Bering Sea and Aleutians, while Poland operated in the Gulf of Alaska in 1978. Both catch only small amounts; these are combined in Table 2 with other foreign catches.

The U.S.

The U.S. domestic fishery for bottomfish other than halibut has included three types of effort. These are the Southeast longline fishery for sablefish, the trawl and incidental fishery for bait fish in both the Gulf of Alaska and Bering Sea, and a small seine, longline, and trawl fishery for cod, flounder, and pollock for human consumption.

Sablefish. The domestic sablefish fishery was unimportant until 1935, when the catch began to increase. The peak domestic year was 1946, when slightly more than 2,800 metric tons were landed. By the 1960s and early 1970s, catch had fallen to less than 1,000 metric tons, recovering to 1,750 metric tons in 1976 (nearly all in Southeastern), but falling to about 1,400 metric tons in 1978 (again, nearly all in Southeastern—only 800 pounds were reported in Western Alaska).[2]

Baitfish. The bait fishery, which includes almost all bottomfish species, is an outgrowth of the crab and halibut fisheries. About two-thirds of the recorded Gulf of Alaska baitfish are landed at Kodiak. The total recorded amount increased from 96 metric tons in 1972 to 303 metric tons in 1976. The North Pacific Council estimates that unrecorded catch may equal or exceed recorded catch. A rough estimate of total domestic catch of bottomfish for bait in 1978 is about 2,500 metric tons, perhaps 1,300 metric tons in the Bering Sea. Both shrimp and crab boats trawl for bait fish on occasion, while halibut vessels both use and deliver baitfish.

Cod, Flounder, and Pollock. Small-scale trawling for flounder and pollock for human consumption began in 1976 in Southeastern Alaska, centered at Petersburg. There was also some seining for these species, as a sideline of a few salmon seiners. Total catch of all bottomfish in the Southeast in 1978 was about 3,000 metric tons, or about three quarters of U.S. bottomfish catch in Alaska waters. Total reported domestic Bering Sea bottomfish catch landed in Alaska (apparently at Kodiak) for 1978 was 1,341 metric tons, compared to an initial domestic allowable harvest of 17,600 metric tons. The Gulf of Alaska catch was 3,160 metric tons, compared to an initial domestic allowable harvest of 44,500 metric tons. The shortfall seems to be partly explained by the slow development of processing capability and poor market conditions. The North Pacific Fisheries Management Council stated in their Fishery Management Plan in April 1978 that eight companies were planning to develop bottomfish capacity in sixteen plants around the Gulf. However, the University of Alaska Cooperative Extension Service reported in May 1979 that only three plants were set up for mechanical filleting of bottomfish, and currently only one plant is running a successful filleting operation (on flounder and rockfish). Some other plants freeze bottomfish on a small scale without filleting.

The Markets

Domestic Markets—Past, Present, Future

Historically, there have been fairly large domestic markets in the United States for the bottomfish resources of the North Pacific. Virtually all of the domestic catch and much of the foreign catch goes into the fresh and frozen trade, and U.S. consumption in this area has shown strong growth. For example, the U.S. "consumption" (production plus imports) of groundfish fillets and steaks has increased by about 43 percent in the last 10 years, to almost 300 million pounds, in spite of the products having become relatively more expensive. The wholesale price index for groundfish steaks and fillets increased about 70 percent between 1969 and 1978, relative to prices of all meats, poultry, and fish. The consumption of frozen fish "blocks," which are used in making breaded and battered fish sticks and portions, has increased about 51 percent over the same period, even though the wholesale price of sticks and portions has also increased 30 percent relative to all meats, poultry, and fish. As shown by the following discussion, however, the groundfish market can be quite volatile.

Demand Vs. Prices, 1969-1978. Figure 2 shows the patterns of U.S. prices and supply of frozen bottomfish fillets and steaks and frozen blocks from 1969 to 1978, compared to some similar figures for red meat, poultry, and fish other than groundfish. Groundfish sales depend upon the relative prices of fish and meat and the overall cost of meat and poultry in the American consumer's budget.

During the 10 years prior to those in Figure 2 (1959-1968) civilian red meat and poultry consumption per capita increased from 195 pounds to 230 pounds, or about 18 percent, while consumption of groundfish sticks and portions increased from 0.63 to 1.63 pounds per capita, or 158 percent. This very high rate of growth is partly attributable to the low starting value for consumption of fish, however.

The rate of growth has been much less steady during 1969 to 1978. This period demonstrates the role of fish as a cheap substitute for meat. In 1972, the Soviet Union entered the U.S. grain markets and bought heavily, driving up the price of related feed grains. Meat became relatively much more expensive that year and the following year, and in 1973, U.S. per capita consumption of meat and poultry fell below its 1969 value. At the same time, there was short-term substitution of cheaper fish products, which partially compensated for the reduced consumption of meat and poultry. This is reflected in Figure 2 in the sharp increase in U.S. supply (production plus imports, less change in inventories) of groundfish fillets, steaks, and blocks in 1972 and 1973.

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[2] The Japanese caught an average of 6,800 metric tons off Southeast during 1967-74, while Korea caught between 600 and 1,400 tons in this area.

By 1974, however, groundfish wholesale marketers found themselves with relatively high-priced fish inventories when prices of preferred meat and poultry dropped, and the American consumers once again started purchasing meat and poultry in the usual amounts. Consumption of sticks and portions dropped precipitously in 1974 and 1975, and the total supply of groundfish at the wholesale level declined sharply in 1974, rebounding in 1975 as inventories were sold or discarded. Since 1975, it appears that the longer-term trend in per capita consumption of bottomfish may be reasserting itself.

Fast-Food Restaurants—Source of Increased Consumption. Although the bulk of fish sticks are sold domestically to institutional and home buyers, the strongest source of the increase in U.S. per capita consumption over the last few years has been sales of fish portions for fish sandwiches and fish and chips by fast-food restaurant chains. According to the National Marine Fisheries Service, between two-thirds and three-quarters of all groundfish portions sold in the United States are sold through restaurants.[3] Fast-food outlets proved relatively recession-proof in 1974-75, but there is reason to believe some fast-food chains may be overextended in some metropolitan areas.

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[3] The 1978 Department of Commerce report, *Export and Domestic Market Opportunities for Underutilized Fish and Shellfish*, put the proportion of pollock portions sold to restaurants at 47 percent and 26 percent to institutions. About 91 percent of sticks go to retail outlets, 9 percent to institutions. Portions constitute over three-fourths of all sales of sticks and portions, up from two-thirds in 1969. For a recent assessment of this market, see "Bottomfish, the Fishery of the Future?" *Pacific Fishing*, 1:2 (February 1980), pp. 24-33.

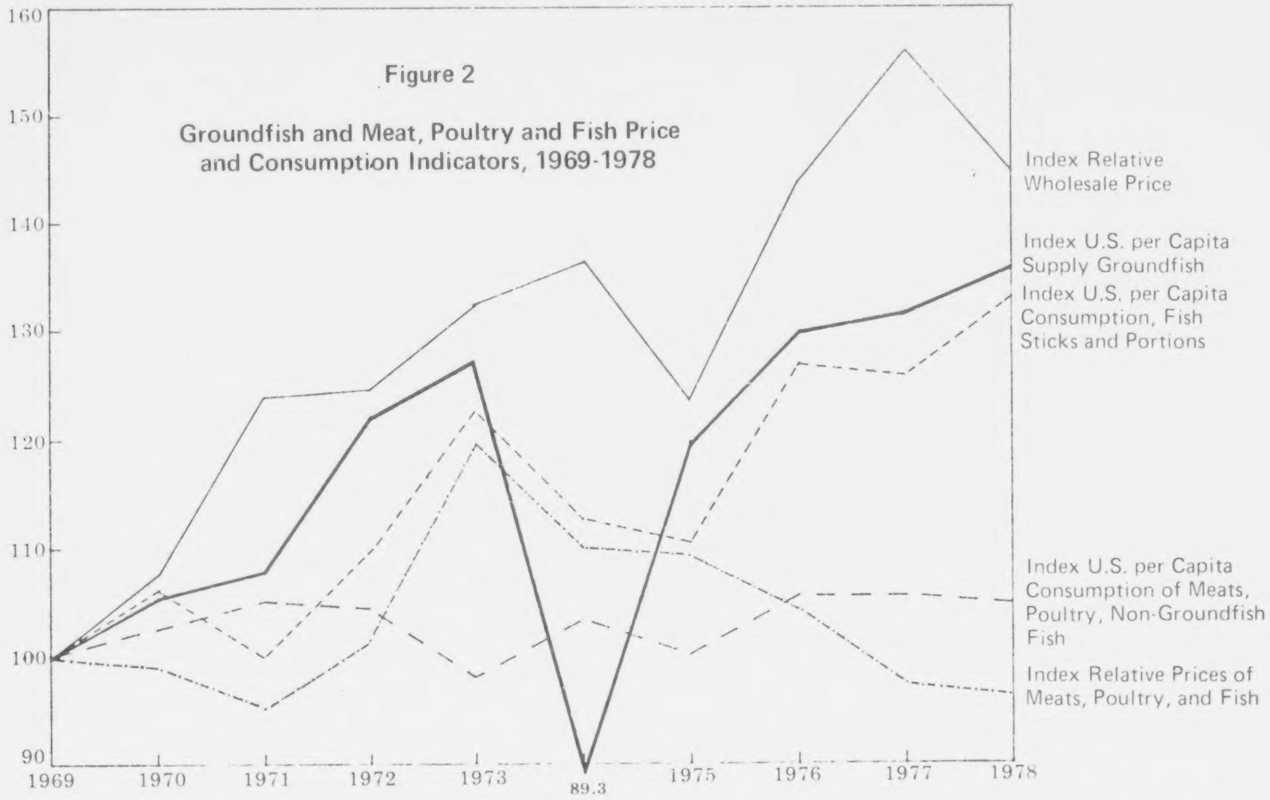

Figure 2

Groundfish and Meat, Poultry and Fish Price and Consumption Indicators, 1969-1978

Long-Term Projected Trends. Thus, while relatively low prices and market penetration have caused a substantial increase in bottomfish sales in the past 10-to-20 years, it is difficult to project a long-term trend of continued expansion due to these factors, particularly if prices of groundfish continue to rise relative to those of preferred forms of protein. On the other hand, there is an almost assured prospect for increased prices for Atlantic cod, ocean perch, flounder, and haddock due to increased scarcity of stocks. This may make it easier for less preferred species such as Alaskan pollock to penetrate existing bottomfish markets.

Table 3 shows a projected range of U.S. consumption of groundfish fillets and steaks and breaded and battered sticks and portions through the year 1990. These projections are based upon U.S. Bureau of Census Series II population projections and two alternative levels of per capita consumption—one based on current (1978) levels and one based on a continuation of the 1969-78 trend in per capita consumption. Even stable per capita consumption results in a substantial increase in the size of the domestic market both for fillets and steaks and for sticks and portions. The crucial question for domestic suppliers is, what share of this expanding market can they hope to capture? Between 75 and 85 percent of groundfish fillets and steaks are imported, and this rises to well over 99 percent for blocks used in making sticks and portions. The problem for new domestic producers of groundfish, will be meeting the foreigners' delivered price for the product. The section on commercial feasibility (Part II) discusses this issue at greater length.

Foreign Markets

Foreign markets are more difficult to forecast than domestic markets because (1) foreign product forms are different from those in the United States, and high quality is expected, and (2) some of our major potential trading partners have erected substantial trade barriers to imported fish in the form of quotas, prohibitions, and tariffs.

Table 4 shows the past pattern of landings and imports of groundfish species for which Alaskan species might substitute in several countries with whom the United States conducts a substantial fisheries trade. The figures highlight several potential market opportunities.

Japan. One of the best near-term opportunities with small-scale potential for Alaska fishermen is sablefish. The Japanese source is dominated by its Alaska catch. For example, in 1976, 85 percent of sablefish landed in Japan came from Alaskan waters—26,880 metric tons. United States' vessels have already come to dominate the sablefish fishery, and the price is relatively attractive. The major challenge for the United States is to rebuild the sablefish stocks and to learn to fish the outside waters of the Gulf of Alaska, which have been traditionally fished by the Japanese and Koreans.

Table 3

Estimated Consumption of Groundfish Products, 1978-1990

(Millions of Pounds)

	Fillets and Steaks		Fish Sticks and Portions	
	Consumption at 1978 per Capita Level	1969-78 Trend in per Capita Consumption Continued	Consumption of 1978 per Capita Level	1969-78 Trend in per Capita Consumption Continued
1978	282.9	282.9	469.6	469.6
1980	290.4	302.8	477.3	501.1
1985	304.4	350.0	500.7	587.8
1990	318.3	400.0	523.7	680.1
Increase 1978-90	35.4	117.1	54.1	210.5
Approx. live weight equivalent (10^3 metric tons)*	53.5	177.1	63.8	248.3

*Live weight: assumed average 25-percent product yield on pollock, about 30 percent on other species, sticks and portions 65 percent fish by weight.

Table 4

Nominal Catches of Select Fish and Imports of Fish, Fresh and Frozen

(1,000 metric tons)

	1970	1971	1972	1973	1974	1975	1976	1977
Canada*								
Flounders & other flatfish	173.1	160.9	145.5	143.5	115.0	114.2	137.1	145.0
Cods, hakes, etc.	317.0	311.4	284.8	251.5	225.2	220.2	261.2	312.7
Ocean perch & rockfish (sebaste)	111.5	115.1	114.0	161.3	90.4	106.1	93.6	73.8
Sablefish	0.3	0.3	0.9	0.8	0.4	0.8	0.6	0.8
Atka mackeral	––	––	––	––	––	––	––	––
Total	601.9	587.7	545.2	557.1	431.0	441.3	492.5	532.3
Imports, fresh & frozen	10.6	12.0	16.1	19.6	20.8	23.1	32.8	49.6
Japan*								
Flounders & other flatfish	295.6	345.7	356.7	388.6	356.7	348.2	352.2	304.8
Cods, hakes, etc.	2,521.5	2,817.4	3,184.9	3,213.5	3,042.8	2,833.2	2,639.6	2,127.2
Ocean perch & rockfish	89.8	108.7	104.3	114.4	80.1	58.3	54.3	30.7
Sablefish	43.7	44.9	55.3	42.1	34.2	31.6	31.8	21.9
Atka mackerel	146.5	147.1	180.6	115.0	143.5	114.7	229.2	235.0
Total	3,97.1	3,463.8	3,881.8	3,873.6	3,657.3	3,386.0	3,307.1	2,719.6
Imports, fresh & frozen	103.2	122.4	134.2	222.2	217.3	241.2	271.7	376.1
Germany, Fed. Rep. of								
Flounders & other flatfish	8.1	6.3	7.7	10.5	9.5	9.9	11.2	18.2
Cods, hakes, etc.	269.1	271.8	234.3	238.1	280.6	225.7	253.2	188.5
Ocean perch & rockfish	73.6	71.2	60.5	62.5	60.3	56.4	56.4	88.5
Sablefish	––	––	––	––	––	––	––	––
Atka Mackerel	––	––	––	––	––	––	––	––
Total	350.8	349.3	302.5	311.1	350.4	292.0	320.0	295.2
Imports, fresh & frozen	221.0	220.7	212.2	251.7	234.5	233.3	239.2	251.9
Denmark								
Flounders & other flatfish	61.2	57.2	63.0	53.7	53.1	54.3	59.3	60.2
Cods, hakes, etc.	548.9	458.1	555.1	501.4	852.3	567.9	721.2	565.7
Ocean perch & rock fish	––	––	––	––	––	––	––	––
Sablefish	––	––	––	––	––	––	––	––
Atka mackerel	––	––	––	––	––	––	––	––
Total	610.1	515.3	618.1	555.1	905.4	622.2	781.1	625.9
Imports, fresh & frozen	124.9	125.8	123.7	148.1	178.1	138.4	141.5	155.6
United Kingdom								
Flounders & other flatfish	61.9	63.1	62.4	61.5	50.5	45.6	50.6	54.3
Cods, hakes, etc.	719.0	692.8	654.8	640.7	611.9	556.4	539.3	437.0
Ocean perch & rockfish	7.6	7.8	8.9	9.1	11.3	6.0	6.5	7.6
Sablefish	––	––	––	––	––	––	––	––
Atka mackerel	––	––	––	––	––	––	––	––
Total	788.5	763.7	726.1	711.3	673.7	608.0	596.4	498.9
Imports, fresh & frozen	109.8	96.9	104.3	117.5	116.9	113.9	115.2	120.8
France								
Flounders & other flatfish	21.6	21.8	20.0	21.3	18.3	18.3	19.9	19.6
Cods, hakes, etc.	303.2	291.4	277.8	283.2	297.8	264.2	284.6	266.7
Ocean perch & rockfish	––	––	––	––	2.5	2.2	3.5	3.2
Sablefish	––	––	––	––	––	––	––	––
Atka mackerel	––	––	––	––	––	––	––	––
Total	324.8	313.2	297.8	304.5	318.6	284.7	308.0	289.5
Imports, fresh & frozen	95.7	122.8	129.8	131.5	159.8	161.5	170.5	203.2
Italy								
Flounders & other flatfish	3.7	3.1	3.5	3.6	4.0	3.7	4.4	4.8
Cods, hakes, etc.	10.9	11.5	13.2	13.9	22.9	28.5	31.6	27.9
Ocean perch & rockfish	––	––	––	––	––	––	––	––
Sablefish	––	––	––	––	––	––	––	––
Atka mackerel	––	––	––	––	––	––	––	––
Total	14.6	14.6	16.7	17.5	26.9	32.2	36.0	32.7
Imports, fresh & frozen	108.1	122.2	124.6	122.9	121.9	132.4	143.3	143.8

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*Note: Both Canada and Japan are substantial exporters of the reported species. Thus, foreign catch plus imports overstate foreign consumption, particularly in Japan and Canada. Export data is not reported in a form which permits derivation of foreign consumption, however.

Sources: Data on nominal catches from F.A.O. *Yearbook of Fishery Statistics, Catches and Landings,* Vol. 38, 1974; Vol. 44, 1977.
Data on imports from F.A.O. *Yearbook of Fishery Statistics, Fishery Commodities,* Vol. 45, 1977.

Pollock, which represents the largest of Alaska's exploitable fish biomass, faces several difficulties in foreign markets. Despite the market for pollock in Japan, the Japanese have prevented imports of pollock products (including pollock roe) and products of other cod-like fishes with very restrictive import quotas, quality requirements, and tariffs amounting to 10 percent of value.[4]

In the recent round of negotiations in Tokyo on the General Agreement of Tariff and Trade, Japan agreed to reduce its tariffs from 10 percent to 6 percent on these types of fish. In addition, at the U.S. trade mission meetings in 1978, the Japanese assured the United States that the import quota system would "accommodate" U.S. exports. However, since the quotas are allocated to Japanese importers, who can use the quotas for other countries and species other than pollock and cod, the United States may have difficulty finding willing importers.

Since Japan has very exacting product quality standards which are strange to Americans, the question is whether inexperienced U.S. fishermen and processors can meet these standards. The answer is important, but unknown.

Korean and Taiwanese Markets. Korean markets are also tightly controlled. Although the Korean government permits practically unlimited imports for processing and re-export to earn foreign exchange, the tariff rate on foreign fish products for Korean domestic markets is around 30 percent, and all imports of fresh, frozen, or iced fish are subject to the approval of the Office of Fisheries.[5] Taiwan's principal barriers to U.S. exports are very high tariffs and their complex import licensing scheme.

While the barriers to trade in Japan, Korea, and Taiwan may be reduced further through hard bargaining, Alaska processors may be at a disadvantage competing on Far East markets for some time to come.

European Markets. It may appear that the European markets are somewhat easier to penetrate since their products are similar to those consumed in the United States, and marketing arrangements are more easily understood. In most of the European Economic Community (Common Market) countries, per capita consumption of groundfish—primarily cod, haddock, and Atlantic pollock (saithe)—is far larger than that in the United States. Furthermore, these nations have problems with (1) depleted stocks in the North Sea, Iceland, and the Faroe Islands, (2) assertion of 200-mile limit laws by Canada, the United States, and Iceland, and (3) the imposition of fishing quotas. Several of the major consuming nations are experiencing declining catches and therefore declining domestic supplies of traditional species such as cod and haddock. These factors should combine to help U.S. processors.

There are some complicating factors, however. There has been consumer resistance to the substitution of relatively abundant Alaska pollock for the more desirable whitefish species. The 1978 Department of Commerce Study, *Export and Domestic Market Opportunities for Underutilized Fish and Shellfish*, pointed out, for example, that initial experiments in the United Kingdom using Alaska pollock to substitute for cod and haddock did not work because pollock "did not travel or handle well." The reason may actually be that European markets are basically oriented toward locally caught, high-quality fresh fish rather than imported frozen fish, even though sales of frozen convenience foods are on the increase. This may create problems for American firms attempting to sell in European markets since it would be difficult to supply the fresh fish market from the U.S.

The European market may be more accessible to higher-priced catch such as cod or ocean perch (rather than to pollock), but only if the United States is able to meet very exacting standards for the product.

Summary

In general, the market prognosis for whitefish seems best for a U.S. domestic market, which is facing possible declining supplies from Europe, Japan, and Korea. Sablefish from Alaska are currently marketed in the United States, mostly in smoked form, and will probably continue in this market.

The significant problem in the U.S. market is that prices are determined both by the low catching and processing costs enjoyed by foreign (primarily Asian) fleets and marketers. Furthermore, U.S. consumers perceive whitefish as a cheaper substitute for preferred meat and poultry. This makes the U.S. price low, so that U.S. processors can only compete by paying prices to fishermen below their perceived opportunity costs.[6]

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[4] The major Japanese pollock market is for *surimi* or fish paste, which is made from minced pollock and sells at about 50 cents per pound at current exchange rates.

[5] Korea also consumes very little of the fish it catches off Alaska, the Korean market being essentially reserved for local fishermen.

[6] That is, prices below what they would be receiving if employed in another fishery or by delivering bottomfish to the crab fishery for bait, where bottomfish have demanded the highest price.

PART II

COMMERCIAL FEASIBILITY OF CATCHING AND PROCESSING BOTTOMFISH

In the following discussion, the author assumes that fishermen and processors accept that they cannot influence the product price. The main relevant market in this discussion is the U.S. East Coast, which is assumed to be less risky than foreign markets. The first analysis undertaken here estimates the cost of fishing for bottomfish under (a) optimistic and (b) more conservative operating conditions. Using these estimates, the second analysis then estimates the processor's costs and his ability to pay a price to the fisherman that would make the fishing effort worthwhile. The section concludes that, given today's prices, it is unlikely that there will occur a match of product prices and fishing and processing costs that would make both fishing and processing profitable. Profitability is at least questionable, even under more optimistic conditions.

A review of recent studies concerning the Alaska bottomfish industry prospects discloses that interest centers on using existing small coastal trawlers, most between 70 and 130 feet long. It is unlikely that smaller vessels could successfully participate in a year-round fishery, although smaller vessels might conceivably participate in a summer fishery or an inside fishery such as the Southeast Alaska longline fishery and experimental whitefish fishery.

The Critical Operating Variables

Table 5 illustrates some of the critical variables which may determine the profitability of a bottomfish trawling operation delivering its catch to a shore-based processor. This hypothetical example focuses on two classes of vessel: a relatively large, 120-foot crabber/ trawler of the type being built for the Bering Sea crab fishery, with the reserve intention of conversion for trawling; and an 85-foot shrimp trawler, since these are considered adaptable for bottomfish. Smaller and larger vessels have somewhat different prospects; however, the considerations which will determine profitability will be basically the same. These are: fishing time, productivity of fishing effort, price and deliverability of fish, operating cost, crew size, capital cost, and opportunity cost (the income the vessel would have produced if engaged in another fishery). Since the published studies do not agree upon the assumptions, the precise figures used are the author's estimates, with assumptions selected from various studies cited. The first column reflects a middle range of "best guesses" in these studies, and the remaining columns reflect a series of estimates based on more conservative values, also from these studies.

Fishing Time and Down Time

One of the most critical influences on profitability is fishing time. This is determined primarily by the size of the vessel; the weather; the time required for unloading, crew rest, maintenance and repairs; and the holding capacity of the fish (that is, how long before the catch deteriorates significantly).[7] The location of fish stocks and processors also has an influence. Large vessels are generally capable of operating in more adverse weather conditions than small vessels. They also have greater storage capacity, which increases the total time the vessel can stay on the fishing grounds.[8]

Down time, another significant influence on profitability, will depend upon the age and quality of the vessel and gear; care and quality of maintenance; and luck with weather, parts suppliers, and the like. Newer vessels, to some degree, will probably have an advantage here which offsets their higher costs. More important may be a highly trained skipper and crew. In the example in Table 5, average fishing days are reduced in the conservative case due to bad weather, longer periods in port, and longer running times between fishing ground and processor. Both of the low-range estimates are close to those assumed by Yaeger (1977) and AFDC (1979).

Fishing productivity is primarily a function of the skipper's knowledge, his ability to locate stocks, and the crew's ability to handle nets and fish once they are brought on board the vessel. In a fishery characterized by low value of catch, both the volume of catch per haul and the number of hauls which a crew can make per fishing day are critical. Expected catch per haul in experimental trawling is extremely variable, but the best guesses of people in the industry, based on Soviet records and published studies, settle on a range of 10-to-30 metric tons, with an average value of around 20-to-24 metric tons. (An exception is the Alaska Fisheries Development Corporation, which has guessed as high as 50 metric tons.) The "best guess" value has been reduced in the conservative case by 50 percent, although initial industry experience may be even worse until skippers and crews gain experience in the fishery.

Price

The price which fishermen can get for their catch will depend upon the mix of species caught; condition of the fish when landed; degree of on-board processing; and, of course, the wholesale price and costs of processing, transporting, and selling the fish.

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[7] Various sources (Yaeger, NEFCO, and Martin) put this at 4 to 6 days.

[8] An interesting hypothesis is that bigger boats might be more likely to stay on the fishing grounds during the February-March period when cod and pollock have roe, which increases catch value significantly (Yaeger, 1977; Combs, 1979).

Table 5

Effects of Operating Variables on Vessel Profitability, 1979 Prices

	(1) Basic (optimistic) Case	(2) Lower Fishing Productivity	(3) Lower Value of Catch	(4) Lower Proportion of Time Fishing	(5) Higher Operating Costs
120-foot Crabber/Trawler (new):					
Operating days (Nov.-Aug.)	240	240	240	227	240
Days at sea	210	210	210	181	210
Days fishing	160	160	160	108	160
Catch rate (MT per day)	30	15	30	30	30
Value per ton (1979 dollars)	$ 316	$ 316	$ 213	$ 316	$ 316
Crew size	6	6	6	6	7
Gross Income (year)	$1,516,800	$758,400	$1,022,400	$1,023,840	$1,516,800
Expendables:					
Fuel ($0.90/gal.)	180,274	180,274	180,274	174,997	275,000
Food ($15/man/sea day)	18,900	18,900	18,900	18,900	22,050
Ice (40T, 32 trips, $32)	0	0	0	0	40,960
Misc. & lube (10% fuel)	48,027	47,783	47,783	47,500	52,000
Gross Profit (for division)	$1,269,599	$511,448	$775,443	$782,443	$1,126,790
Crew Share (7% per man)	533,232	214,806	325,686	328,626	552,127
Gross Boat Share	736,367	296,637	449,757	453,817	574,663
Captain's share (10% of boat share)	73,637	29,664	44,976	45,382	57,466
Gear maintenance	15,000	15,000	15,000	15,000	60,000
Net Boat Share	$ 647,730	$251,973	$ 389,781	$ 393,435	$ 502,197
Fixed Annual Costs (depreciation, insurance, maintenance)	$ 613,450	$ 613,450	$ 613,450	$ 613,450	$ 615,050
85-foot Shrimp Trawler (converted):					
Operating days (Aug.-May)	230	230	230	218	230
Days at sea	200	200	200	173	200
Days fishing	150	150	150	100	150
Catch rate	20	10	20	20	20
Value per ton (1979 dollars)	$ 316	$ 316	$ 213	$ 316	$ 316
Crew size	5	5	5	5	6
Gross Income	$948,000	$474,000	$639,000	$632,000	$948,000
Expendables:					
Fuel	$ 72,000	$ 72,000	$ 72,000	$ 62,000	$ 93,272
Food	18,000	18,000	18,000	16,290	21,000
Ice	0	0	0	0	28,800
Misc.	12,200	12,200	12,200	11,200	14,327
Gross Profit (for division)	$845,800	$371,800	$536,800	$542,510	$790,601
Crew Share (7% per man)	296,030	130,130	187,880	189,878	332,052
Gross Boat Share	549,770	241,670	348,920	352,632	458,549
Captain's share (10% of boat share)	54,977	24,167	34,892	35,263	45,855
Gear maintenance	12,000	12,000	12,000	12,000	25,000
Net Boat Share	$482,793	$205,503	$302,028	$305,369	$387,694
Fixed Annual Costs (excluding conversion costs)	$198,417	$198,417	$198,417	$198,417	$200,017

Sources: Combs (1979), Yaeger (1977), AFDC (1979), Arthur D. Little (1978).

During the summer of 1979, according to 1979 NMFS Market News "pink sheets," dockside pollock prices at Cordova, Kodiak, and Petersburg were 3-to-8 cents per pound. Cod were 19-to-21 cents round (24-to-36 cents dressed), rockfish 8-to-15 cents (30-to-35 cents dressed), miscellaneous flatfish 7-to-20 cents, and sablefish from 32-to-85 cents dressed, depending on size.

Because of the likelihood of rising domestic market prices for most substitutes for these fish, Table 5 uses *existing* prices as the conservative basis for value of catch. The optimistic value assumes that real prices for all species will be higher than today's by an average of 50 percent. (The average real dockside price for New England groundfish increased about 76 percent between 1967 and 1978. However, this increase was partly due to the very low starting value and may not continue.)

For purposes of the example, the best-guess case assumes the same mix of species as in the Arthur D. Little study (ADL, 1978): 65 percent pollock, 15 percent cod, and 20 percent flatfish and miscellaneous rockfish. The pessimistic estimate was based on the catch breakdown as delivered in New England Fish Company's 1978 processing experiment: 81 percent pollock, 16 percent cod, 3 percent flatfish and miscellaneous.

New England Fish found that a large portion of pollock were below the 17-inch minimum size that their filleting equipment could handle. This underscores a deliverability problem with trawl fisheries—either the plant must be set up to handle a widely variable catch or fishermen may be unable to sell a substantial portion of their catch.

The price of delivered catch and its acceptability can be increased by dressing (cleaning) the fish on board the vessel; however, since this takes crew time, it can be achieved with inexperienced crews only by increasing the crew size, which results in smaller crew shares, or by diverting the crew members from handling nets to processing fish, which reduces the number of hauls. Therefore, this possibility is not shown in Table 5. While European crews do process fish on board, in many cases the price of catch is subsidized and in most cases the crew is highly trained and efficient in this sort of labor. In contrast, American crews would at least require a considerable training period.

Type of Cooling System

Vessels which use ice rather than refrigerated sea water (RSW) cooling systems in their fish holding tanks also incur higher operating costs due to purchases of ice (Yaeger, 1977). RSW systems make the original cost of the boat higher, however. The basic case in Table 5 reflects an RSW cooling system and a midrange of estimates from existing studies of the total operating time spent fishing. The conservative estimate in column 5 reflects a higher proportion of running time to fishing time and use of a flaked ice cooling system.

Boat Size and Profit

Variable costs increase with the size of the boat. Mainly, this results from fuel costs, however, maintenance and repair may also be more expensive in the larger boat. Under the reasonably optimistic price and catch assumptions portrayed in the basic case (Table 5), both the $1 million, 85-foot vessel and the $3 million, 120-foot vessel appear to make a profit. However, if catch is only half as large as expected (column 2), the 120-foot vessel is unable to cover even half of its annual fixed costs and the 85-foot vessel makes a profit of only $7 thousand for 8-months' work. Since the owner's equity in the 85-foot vessel is assumed to be 25 percent, or $250 thousand, the rate of return is only 2.8 percent. If real prices do not rise as in the optimistic case, column 3 shows the new 120-foot vessel could cover only about two-thirds of annual fixed costs, while the 85-foot converted vessel shows an apparent profit of $104 thousand. However, boat conversion costs are excluded from annual fixed costs in the table. AFDC (1979) estimated these costs at nearly $600 thousand. Annual interest charges and depreciation on this cost range from 80 to 100 thousand dollars, reducing the before-tax rate of return on equity to less than 10 percent.

Column 4 shows that bad luck concerning weather, long distances between fishing grounds and processors, and inefficient repair and unloading operations could drastically reduce profitability, even with optimistic price and catch assumptions. Column 5 shows that high-range operating costs could also cut profits significantly.

Comparison of Findings with Other Studies

How do these conclusions compare with those in other Alaska studies on commercial feasibility of bottomfish vessels? The most optimistic is the Arthur D. Little (1978) study, which shows net returns for an 86-foot vessel of about 15.9 percent on capital. This is a result of having assumed a relatively high number of fishing days per year (178), low costs (fuel at $.46 per gallon, ice at $16 per ton, provisions at $13 per man-day), a crew of only 4 persons, and a vessel worth only $615 thousand, including conversion costs. Most of the assumptions would now be considered too optimistic.

The Combs (1979) study, being a benefit-cost analysis rather than analysis of commercial feasibility, approaches the problem somewhat differently, and shows a before-tax rate of return for an 85-foot vessel fishing mixed bottomfish at 23 percent with only 12 metric tons per day catch. However, Combs assumes 16-to-20 cents per pound as his dockside price (at least 6 cents per pound, or 60 percent above today's average prices) and his rate of return goes down to a loss at a price of 10 cents per pound. With a higher catch (25 metric tons) and prices at 10 cents per pound, the rate of return is higher (35.2 percent), but at existing pollock prices of 6-to-8 cents, the before-tax rate of return is somewhere between a loss and 10 percent.

Most analyses show the larger 120-foot vessels losing money on bottomfish in all but the most optimistic circumstances. The underlying reason is that because they are bigger they cost more to run; however, their catch rates are not correspondingly higher, but primarily depend upon the ability of the skipper and crew. The fish cannot always be held long enough to permit filling the larger vessel. Clearly, in low-value, high-volume fisheries, both productivity and price are crucial.

Opportunity Costs

What other opportunities must be given up by vessels committed to a bottomfish fishery? Crabber/trawlers fishing in the Bering Sea for king crab earned an average of $376,000 per vessel in 1976 on this fishery alone and half a million dollars in all fisheries combined. The fishery lasts about 30-to-40 days in most areas (AFDC, 1979) between September 10 and sometime in October. Therefore, it might be possible for a vessel to fish both king crab and bottomfish and pay back the boat investment faster. Using the boat for bottomfish, however, would conflict with the winter/spring fishery for tanner crab. Therefore, total fishing days for the bottomfish fleet might well be reduced because of the much higher incomes which can be earned per fishing day in the crab fishery. A similar opportunity cost applies for shrimp trawlers. Shrimp prices in 1978 at Kodiak ran 13.5-to-16.5 cents a pound in this fishery, where productivity of skipper and crew is probably higher than in the bottomfish fishery. It is likely, therefore, that fishing for bottomfish will first become attractive for fishermen as a *supplement* to income from shrimp and crab, rather than as an exclusive venture.

Processing Economics

Five reports have discussed onshore bottomfish processing economics in Alaska: Arthur D. Little (1978), NEFCO (1978), Martin (1979), Rogers (1979), and Combs (1979). They reach a variety of conclusions concerning feasibility. Three reports [Rogers (1979), Arthur D. Little (1978), and Combs (1979)] discuss the economic feasibility of catcher/processors offshore. The only descriptions of actual processing experience in Alaska, both pilot operations, are contained in the NEFCO and Martin reports. Even though each groundfish processing plant would probably be different, existing reports do suggest some key issues determining profitability:

1. Since groundfish wholesale prices are determined on the major markets in Boston and New York, the maximum price at the plant gate in Alaska would simply be the East Coast price, less the costs of getting the fish there and selling them. This could leave too little margin for processing.
2. The costs of shipping to East Coast markets can vary significantly from various points within Alaska. The higher cost locations therefore either have less processing margin or must pay a lower price to fishermen. Where the price is less than 10 cents a pound, a 2-cents-per-pound difference in transport costs might make fishing unattractive, even if processing margins were adequate.
3. Labor productivity and cost are critical to processing costs.

On-shore Processing

Table 6 illustrates the sensitivity of the dock price for fish to a few key variables. In each case, the table begins with the weighted average price of the products, subtracts representative transportation and processing costs, required before-tax rates of return on invested capital, and adjusts for the average weight loss in processing to arrive at an average price of catch. The basic case is adapted from Rogers (1979) and ADL (1978), with information on high investment and depreciation from Combs (1979), NEFCO (1978), and Martin (1979).

The Rogers' analysis took information on total production from the Arthur D. Little analysis of a hypothetical bottomfish operation in an existing plant located at Unalaska, accepted the ADL operating cost estimates (but not the investment costs), added packaging, selling, and handling costs; and determined that the prototype plant would show a loss paying the dockside prices projected by ADL. Table 6 is also based on the ADL prototype plant but makes the following additional adjustments:

1. The ADL prototype plant includes no operating charges for processing rockfish and flounder. Utility, maintenance, and labor were estimated at the same rates as for cod fillets, about 36.1 cents per pound of output.
2. Both NEFCO and Martin estimated equipment life in actual Alaskan plant operations at 3 years with 50 percent salvage value. This adjustment was made for depreciation.
3. Plant economics of the ADL and Rogers' reports were based on the delivery of gutted fish, although crew size in the vessel section of the ADL study appeared to be too small to permit on-board gutting. The ADL study reported a gutted/round weight ratio of .84. The dockside price was therefore adjusted to reflect the round-weight value of catch to be consistent with Table 5.
4. ADL investment costs were adjusted upward, as recommended by Rogers.

Table 6 shows that at the existing output prices assumed in the ADL study, the hypothetical full-scale shore plant located at Unalaska cannot afford to pay much more than the current prices shown in NMFS pink sheets, which would not be attractive to full-time fishermen even at high productivity (see Table 5, column 3). This would be true even if the owners of the plant were willing to accept processing and marketing risks for only a 10-percent real, before-tax rate of return on equity. The table also shows that the significant sources of processing costs lie in plant labor and transportation. Only with substantially higher average product prices would the plant shown be able to pay dock prices attractive to fishermen.

Apparently, small-scale processing of higher-valued whitefish may be profitable at current prices, although large-scale processing (as shown by the example) is not. One Southeast firm has continued to process sablefish and flounder, the latter in individual, quick-frozen (IQF) form for domestic markets. Published data is not yet available on this operation. In summary, it appears that major onshore processors of groundfish are unlikely to attract fishermen without: (1) greatly reduced transportation costs, (2) much higher productivity, (3) much higher prices, or (4) a combination of all three.

Table 6

Shore Processing Plant Break-Even Calculations
(1979 dollars)

	Basic Case	Higher Price	Larger Investment (new plant)
Input: 1,000 lbs./yr.	27,918	27,918	27,918
MT/yr.	12.7	12.7	12.7
Boston/Gloucester			
Wholesale Value per lb. Product (avg.)	$ .893	$ 1.000	$ .893
Less: Freight, wharfage, drayage, Ins.	.120	.120	.120
Storage, handling, insurance	.020	.020	.020
Gross Sale Value Products (Avg.)	.753	.860	.753
Less: Selling Cost (5% of Gross & Waste)	.038	.044	.038
Net Sale Value	.715	.816	.715
Less: Direct Labor	.206	.206	.206
Supplies & Packaging ($.02/lb.)	.020	.020	.020
Utilities	.006	.006	.006
General and Administrative	.040	.040	.040
Maintenance	.005	.005	.005
Fixed Costs:			
Depreciation	.050	.050	.072
Interest Expense (10% interest rate, 40% equity)	.018	.018	.026
Adjust for Sale of Waste (add)	.014	.014	.014
Income before Taxes	.384	.485	.326
Less: Return on Equity (20%)	.024	.024	.053
Adjustment for Gutted Weight (divide)	2.866	2.866	2.866
Less: 1% Raw Fish Tax (gutted wt.)	.001	.002	.001
Price to Fisherman/lb. (round wt.)	$ .105	$ .134	$ .094
Price per Ton (round wt.)	$231	$295	$207

Basic Yield Data

	Pollock	Cod	Other
Lbs. input per lb. output for species (allows 1% inventory loss)	3.156	2.168	2.448
Ratio of species input to total input	.65	.15	.20
Specie input per lb. output	2.051	.325	.490

(above totals equal 2.866 round wt./lb. output)

Investment for conversion:	$2,987,280	Deprec. cost (3 yrs.) =$497,800/yr. (50% salvage)
Investment for new plant:	$6,580,000	Deprec. 30 yrs. plant, 3 yrs. equip. (50% salvage on equip., 0% salvage on building) = $717,133.

Sources: Arthur D. Little (1978); Rogers (1979).

Off-shore Processing

The only evaluations of offshore processing currently in published form are the Combs' evaluation of hypothetical 215-foot and 250-foot catcher/processor vessels and an evaluation of larger vessels in the ADL study. The outcomes of these evaluations are summarized in Table 7. Combs' two types of vessels produce a different range of products. The larger vessel targets on pollock, and about 90 percent of all output is pollock blocks, surimi, headed pollock with roe, and fishmeal. Nearly 41 percent consists of surimi.[9] The smaller vessel produces 45.4 percent flatfish fillets and 29.4 percent fishmeal and is heavily dependent on income from the fillets. Both analyses assume wholesale prices for the output about equal to current Boston/Gloucester delivered prices; however, they only allow five-to-six cents per pound average shipping costs for products delivered from Alaska to the East Coast. (At current rates, the shipping charge, including refrigeration and handling for refrigerated vans from Dutch Harbor to Seattle, is around 7.5 cents per pound plus 7.6 cents from Seattle to Boston.) Even with low transportation costs, the Combs' figures show that it would require about a 10-percent increase in real prices of groundfish relative to real costs before full-time catcher/processors would start showing the before-tax 15-to-20 percent rates of return which would be minimally attractive to investors. While this is possible before 1990, current prices would not justify catcher/processors. The Arthur D. Little analysis of larger vessels delivering to Seattle also shows unfavorable rates of return, at even lower costs.

Summary

In summary, a major bottomfish fishing and processing effort mounted with the current fleet and processors would require higher real wholesale market prices—at least 10 percent higher and probably much more than that—to be attractive to capital markets. This might be achieved by tariffs or other forms of market protection, but such protection is contrary to stated Federal policy of generally lowering barriers to international trade. Without such domestic market protection, it may take several years to achieve the necessary price increases.

It is also clear that bottomfish operations are more attractive to fishermen on high-valued groundfish species, and as part-time rather than full-time activities. To some extent, this conflicts with the processor's desire to utilize his processing equipment to the fullest possible extent. Processors will probably begin with more flexible hand-processing or limited machine processing of species like ocean perch and flounder, and they will only gradually move into lower-priced species as greater capital investment becomes attractive. This will also accommodate the fisherman's wishes. Finally, in both fishing and processing, the cost and productivity of labor is a critical component. The success of an endeavor in either field will depend on attracting a highly trained, stable production work force. This is contrary to the history of Alaska processing sector in particular and could defeat the effort to build a U.S. bottomfish industry in Alaska.

Table 7

Earl R. Combs, Inc. and Arthur D. Little's Analyses of Offsnore Processing

(1979 dollars)

Vessel		Daily Catch (MT)	Annual Product (MT)	Value per Pound Target Output (adjusted for waste)	Cost per Pound of Output	Rate of Return on Equity
250-foot vessel (94.7% pollock, 4.2% flatfish, 1.1% rockfish) [Combs]	Case 1	75.7	4,914	$ .580	$ .62	(loss)
	Case 2	75.7	4,914	.650	.637	4.5%
	Case 3	75.7	4,914	.720	.645	19.7%
215-foot vessel ("other groundfish") [Combs]	Case 1	Not given	3,322	.680	.717	(loss)
	Case 2	Not given	3,322	.760	.726	8.3%
	Case 3	Not given	3,322	.840	.734	24.7%
300-foot vessel (56% pollock, 15% cod, 20% other) [Little]		76.7	4,039	1.016	.628	4.9%

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[9] The study assumes that Japan will permit surimi imports by 1984, the year for which market entry of these processors is forecast.

PART III
CONSEQUENCES OF DEVELOPMENT

While it may appear from the two previous sections that the development of Alaska-based bottomfish fishing and processing is questionable, it is still worthwhile to focus on a relatively optimistic scenario which assumes the basic commercial feasibility of the industry and analyze the probable consequences of such development on Alaska. These consequences include the increase in jobs, income, and population associated with bottomfish development as well as increased income for state and local government and additional private and public investment.

Employment and Revenue Opportunities

Employment

There are two existing estimates of the number of jobs which would be created by an expanded American bottomfish fishery in Alaska's waters, those by Combs (1979) and Arthur D. Little (1978). Table 8 puts these two studies on a common footing by beginning with basic assumptions about direct employment and then comparing the results of several different assumptions concerning support sector employment and residency of the workers. The original ADL estimate covered the size of the fleet and processing capability at levels of catch ranging from current domestic harvest up to maximum sustained physical yield of the Bering Sea and Gulf of Alaska resources. This estimate assumed that processing would be exclusively shore-based while the Combs' estimate was done only for a level of catch corresponding to a 1979 optimum yield of 1.5 million metric tons, a conservative figure. Table 8 is computed only for this level of catch.

Neither study effectively discusses the extent to which the job counts convert into full-time equivalent employment or the extent to which jobs would be held by resident Alaskans. Table 8 deals directly with these issues. The ADL study, for purposes of computing income taxes, assumes that all fishermen and processors are Alaskan residents. Given the history of Alaska's fishing industry, this is highly unlikely. Combs' development scenario assumed that only about 340,000 metric tons out of 1.5 million metric tons optimum yield is within the 100-to-150 nautical-mile-fishing range of harbor facilities (the distance being determined by boat speed and fish spoilage time). Combs concludes that about 70 percent of the total of 14,150 jobs at full fishery development could be aboard catcher/processors, 17 percent at land-based processing plants, 8 percent on trawl vessels, and 5 percent at shore-support facilities. Since many of the catcher/processors (and at least some of the trawlers) are likely to be based in Puget Sound, some shipboard employment will likely be from that area, particularly since processors who land their fish in Washington can avoid Alaska income taxes.

In Table 8, the first two columns assume that all jobs go to Alaskan residents. The second two columns assume that half of offshore employment is nonresident. The fifth column assumes, in addition, that all catcher/processor employment is nonresident.

Support sector employment in Table 8 is figured on the basis of an Alaskan resident total income multiplier of between 1.5 and 2.0 and an average support sector wage at about its 1978 level ($17,300). Table 8 demonstrates the wide range of employment outcomes which is plausible given a high level of exploitation of the basic resource. All the cases assume (contrary to the outcome of the commercial feasibility discussion above) that processors will be able to pay relatively high prices for bottomfish—12.3 cents per pound of mixed catch in the ADL study and 18 cents and 8 cents for mixed catch and pollock, respectively, in the Combs study. At these prices, Combs shows processors making a before-tax rate of return of less than 10 percent on equity capital—clearly unacceptable. Adjusting the ADL study as Rogers did, and even allowing for two-shift operation of shore processing plants, ADL also shows rates of return below 10 percent.

Clearly then, all the cases in Table 8 may overestimate the impact of full resource development, particularly secondary employment. However, the reported estimates also cover a broad range. One principal reason is the relatively large amount of employment which Combs believes is necessary aboard catcher/processors and the relatively high wages which must be paid. If all workers were Alaskan residents, the impact of fishing and shipboard processing jobs on the Alaska support sector would be quite large. However, if a substantial proportion of vessels, captains, and crews are nonresident, as seems much more reasonable given the current and probable future ownership of large fishing vessels in Alaska, then the statewide employment impact would be small even given substantial development of the fishery.

ADL shows that at a more modest level of development—five shore processing plants and enough boats to supply them on a double-shift basis the year-round—only 952 direct jobs are required: 212 in fishing and 740 in processing. If one-half the offshore job holders were not residents, as in column 3 in Table 8, the total impact would be between 1,250 and 1,700 total new employees in the Alaska economy. If five ports were involved, the impact would average between 250 and 340 new full-time job equivalents in these communities, which is very significant in a port city the size of Unalaska-Dutch Harbor or Yakutat, but less significant in Kodiak or Ketchikan, and insignificant statewide. For the near term, it is unlikely that the impact of bottomfishing will be even this large.

Table 8

Alaska Bottomfishing Primary, Secondary, and Induced Employment Impact

	A.D. Little Adjusted Basic Case (100% Ak. Residents)	Earl R. Combs Basic Case (100% Ak. Residents)	A.D.L. 50% Offshore Employment Non-Resident	E.R.C. 50% Offshore Employment Non-Resident	E.R.C. 100% Catcher-Processor Employment Non-Resident
Optimum Yield (000 MT/yr.)	1,500	1,500	1,500	1,500	1,500
Number of Trawlers:					
New	153	193	153	193	193
Old	53	30	53	30	30
Total	206	223	206	223	223
Number of Catcher/Processors	0	107	0	107	107
Number of Onshore Processing Plants	52	34	52	34	34
Number of Shifts	2	1	2	1	1
Direct Jobs:					
Trawlers	1,214	1,115	1,214	1,115	1,115
Catcher/Processors	0	9,921	0	9,921	9,921
Shore Plants	7,892	2,406	7,892	2,406	2,406
Shore Support	0	708	0	708	708
Total	9,106	14,150	9,106	14,150	14,150
Annual Average Alaskan Employment:					
Trawlers	1,117[a]	711[b]	558	355	355
Catcher/Processors	0	5,230[c]	0	2,615	0
Shore	7,892	3,114	7,892	3,114	3,114
Total	9,009	9,055	8,450	6,084	3,469
Direct Personal Income (millions)					
Trawlers	$ 25.8[d]	$ 26.1[d]	$ 12.9	$ 13.0	$ 13.0
Catcher/Processors	0	202.3[e]	0	101.2	0
Shore Plants	98.7	78.0[f]	98.7	39.0	39.0
Total	$ 124.5	$ 306.4	$ 111.6	$ 179.2	$ 52.0
Induced Employment Range:	3,592- 7,184	8,855- 17,710	3,225- 6,450	5,176- 10,358	1,502- 3,005
Total Employment Impact Range:	12,601- 16,193	17,910- 26,765	11,675 14,900	11,260- 16,442	4,971- 6,473

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[a] Total operating weeks (46) divided by 50, multiplied by job count.

[b] 220 days (31 weeks) for 89 trawlers, 240 days (34 weeks) for 105 trawlers, 180 days (26 weeks) for 30 trawlers.

[c] Complement of vessel (65) multiplied by operating weeks (38 for 60 percent of fleet, 37 for 40 percent), divided by 50 weeks. Crews rotate.

[d] Job count multiplied by wages per worker; $12,500 per processor; $20,000 per crewman; $37,000 per captain.

[e] Computed from wage and crew expense.

[f] Computed from labor plus 11 percent of Gross Revenue.

In summary, although both the ADL and Combs studies project relatively large employment impacts from a fully developed bottomfishery, Table 8 demonstrates that this conclusion largely results from optimistic assumptions about (1) incomes to be earned by the fishermen, and (2) the fishermen residing in the state. Moreover, the impacts projected by these reports would result from full development of the bottomfish industry. At more modest levels of development, the statewide employment impact would at least be much smaller and, in some cases, insignificant.

Potential State Revenue

As shown in Table 9, state revenue from the bottomfish industry could come from a number of sources, including personal income tax on the incomes of fishermen, processing and support-sector workers; taxes on profits on corporate income in processing (trawlers are considered to be owner-operated in the following table); processing taxes; motor fuel tax; and miscellaneous fees and licenses. Table 9 contains estimated revenues from a fully developed bottomfish industry for two cases. The optimistic case is based on the Arthur D. Little study estimated direct tax revenues, adjusted so that the industry takes the 1979 optimum yield of bottomfish. The conservative case is the same as reported in column 5 of Table 8. To be consistent with previous tables in this report and a two-shift operation, fuel is assumed to cost 90 cents per gallon, and fish are sold at the dock in the round at an average price of 12.6 cents, or gutted at 20.3 cents. In the conservative case, only the 340,000 metric tons delivered to shore-based plants would be taxed, and only the incomes of trawler fishermen and shore-based workers would be taxed since catcher/processors deliver their catch only to Puget Sound ports and since they fish outside the 3-mile limit. The corporate income tax is adjusted to a two-shift annual profit and 20-percent rate of return on equity in the optimistic case to be consistent with Table 8.

Table 9

Main State Revenues from Full Bottomfish Development
(millions of early 1979 dollars)

	Optimistic Case	Conservative Case
Annual Catch (000 MT)	1,500	1,500
Personal Income Tax (millions):		
Trawlers	$0.8	$2.6
Catcher processor	0	0
Shore plants	3.9	0.9
Support facilities	0	0.3
Support sector	1.7-3.3	0.7-1.4
Subtotal	$6.4-$8.0[a]	$4.5-$5.2[b]
Corporate Income Tax (millions):	$2.3[c]	$0.7[c]
Fish Processing Tax (millions):	$3.3[d]	$0.9[e]
Motor Fuel Tax:		
Trawlers	$1.7-$2.2[f]	$0.7-$0.9[f]
Processors	0	0
Total	$13.7-$15.8	$6.1-$7.7

[a] Based on fishermen at $20,000 gross income and $511 in taxes, captains at $37,000 and $1,571 in taxes, process workers at $12,500 and $393 in taxes, and support sector workers at $17,000 and $463 in taxes.

[b] Based on wages and employment by type of vessel in Combs study: trawler crews, $38,380 and $1,690 in taxes; trawler captains, $75,300 and $4,716 in taxes; shore plant workers, $12,500 and $393 in taxes; and support sector workers, $17,000 and $463 in taxes. Nonresident fishermen are residents for tax purposes if fish are delivered to Alaska shore plants.

[c] Based on double-shift plant and 20 percent rate of return on old and new plants: $.012/lb. product for old plants, $.026 for new plants; and 10 percent rate of return on borrowed funds: $.009/lb. and $.013/lb., respectively. See Table 6 for single shift figures.

[d] Based on $.121/lb. old plant, $.120/lb. new plant averaged over all species. Source: Table 6, adjusted for double shift. Yield: gutted = .84 x round weight. Input = 2.8 billion lbs.

[e] Based on $.08/lb. pollock, $.18/lb. other; 54 percent is pollock, 46 percent miscellaneous groundfish including pollock. Source: Combs (1979). Input = 750 million lbs./yr.

[f] Five cents per gallon on fuel used by trawlers only. Catcher/processors are assumed to pay Washington motor fuel tax, and do their refueling at Washington ports. Combs records fuel use per trip for these vessels of only about 50 to 75 percent of the fuel capacity of the vessels. Second figure is set at 27 percent above the low figure to allow for the range in vessel sizes reported by ADL.

Table 9 indicates that regardless of whether a relatively optimistic or conservative scenario is chosen, the State of Alaska cannot count on the bottomfish industry to be a major source of tax income, given current tax rates and the expected fishing pattern. If it were possible to tax catcher/processor catch and income because fish products moved through Alaskan ports, the figures in Table 9 would increase somewhat; however, since Table 5 shows that these vessels could be operating on very small margins, there would be ample incentive to avoid taxation by not shipping the fish into Alaska at all, contrary to the goals of the state's fishery development program.

Higher prices for whitefish products would increase the yield of all taxes except the motor fuel tax. However, it does not appear that the fishery would ever yield more in taxes than 20 million 1979 dollars, even under the most optimistic assumptions concerning price increases. It could well yield a lot less.

Local revenues would be largest in cases where new shore facilities paying property taxes are maximized. The ADL study puts the required investment for a new plant at about $5.2 million, while Combs uses figures between $4.5 million and $6.6 million for taxable property and total investment, depending on the exhibit.[10] *Alaska Taxable 1978* reports Alaska's local property tax rates for 1978 of between 10 and 20 mills for most existing towns in which a processing plant might locate. Direct property tax yields at these rates would be about $50-to-$100 thousand 1979 dollars per year on a five-million-dollar plant. One such plant would double the assessed valuation of King Cove, Seldovia, or Yakutat; increase that of Bristol Bay Borough or Dillingham by 25 percent; that of Unalaska or Seward by about 15-to-20 percent; and Ketchikan or Kodiak by 4-to-5 percent. This does not count the increases in assessed valuation due to induced population changes and increased support-sector activity discussed below.

A rough average of assessed valuation per capita for general business and residential areas of the state such as Juneau and Fairbanks is about $20 thousand. An upper bound can probably be set at $30 thousand (Anchorage). In the optimistic case in Table 9, one might expect up to two residents per employee (based on Kodiak and Wrangell-Petersburg Census Divisions). With about three-to-four boats per plant and all fishermen as residents, a locality with one new plant on double shift could expect 192 direct employees, *perhaps* as many as 96 indirect employees (provided *all* state multiplier effects occurred in the community), and up to a maximum of 584 new residents, increasing assessed valuation by another $17.5 million. More realistically, one could expect a number less than that, because many workers may be only part-time residents and will spend their money outside the local area, even if they spend it in Alaska. This will reduce the multiplier effect and the population impact. The property tax base would be still lower if: (1) the local government were to give substantial tax exemptions for the plant, (2) existing plants were modified, or (3) little increase in the local support sector were to occur.

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[10] NEFCO estimated in the Legislature's Interim Bottomfish Committee 1979 report that a brand-new bottomfish processing plant would cost $8 million. A major source of variation may be the cost of land.

Costs of Infrastructure Development

Public policymakers have been concerned about the effects of bottomfish development on the expenditures as well as on the revenues of state and local government. In particular they want to know the potential impact of the industry on demand for community-supporting infrastructure: ports, roads, schools, communications facilities, etc. Since this information is unique for each locality, the existing studies first select sites for potential development and then identify and quantify the impacts. This section comments on that process.

A number of coastal communities in Alaska could conceivably serve as bases of fishing and processing for the Alaska bottomfish industry. The Alaska House of Representatives' Interim Bottomfish Committee (1978) identified thirty-six coastal communities "which appear to be prime locations for fisheries development, particularly bottomfisheries development, within the next 10-to-15 years," but only three or four that would be of immediate prime interest: Petersburg, Cordova, Kodiak, and Dutch Harbor.

In 1978, Denconsult A/S, a Danish consulting firm, made a series of recommendations to the state, listing which existing Alaskan communities best fulfilled the requirements for ideal location and physical environment for bottomfishing. The original list of nineteen was ultimately narrowed down to five: Unalaska/Dutch Harbor, Kodiak, Seward, Yakutat, and Sitka.

The apparent primary listing criteria used by the Interim Bottomfish Committee were adequacy of existing labor force, facilities and resources considered necessary by the industry (e.g. water, electricity, personal services, land dock facilities), and nearness and species mix of fish available. Denconsult, however, was more precise about their criteria, requiring 40 acres for habor facilities at full development, 150 acres for the townsite, and a community size of about 1,500 inhabitants with a steady, reliable labor force. The location had to have an annual sustainable yield of not less than 12,000 tons available within 200 miles and an adequate ice-free harbor. The Division of Community Planning of the Alaska Department of Community and Regional Affairs has drafted baseline assessments of the five Denconsult-recommended communities (DCP, 1979).

Combs (1979) concentrated on ultimate development rather than initial development and listed the following approximate locations for shore facilities in addition to those selected by Denconsult, while recognizing still others might participate: Homer, Cordova, Ketchikan, Chignik, Sand Point, Cold Bay, and King Cove. Combs considered the relative abundance of resources, an operating radius for coastal fleets of 100-150 nautical miles, and environmental conditions such as wind and sea conditions, land availability, and water depth.

All studies rejected communities on the north side of the Alaska Peninsula, the western coast of Alaska, and the Pribilof Islands for immediate development, mostly because of high development and maintenance costs required for harbors and other improvements. Most of the studies recognized that: (1) the emerging bottomfish industry would have to compete for waterfront space with the existing fishing activities, (2) that existing users are already crowding the existing space, and (3) that existing users are expanding. This is particularly true at Dutch Harbor and Kodiak, which also happen to be the best locations for development of bottomfish processing.

Although the Interim Bottomfish Committee mentions the possible conflict with offshore oil development for harbor land, none of the studies appears to take this issue into account in deciding whether space is available, in spite of usable land being identified as a major impediment to development at the best harbors (DCP, 1979).

Table 10 shows some of the possible sites at which support facilities and onshore processing plants might be built. Table 10 also shows Combs' (1979) estimate of total direct and indirect public investments at these sites for the annual processing capacity shown in the table, based on a model community of one thousand people. Investment estimates range from $1.1-to-1.4 million per thousand metric tons capacity, which may be an underestimate since it does not include general community services.

Combs included costs for power supplies, pollution abatement, and dry docks in the private sector for establishing processing plants. Some of these costs could require expenditures of public funds. However, there is also no particular reason to expect exactly the pattern of investment that Combs discussed. For one thing, available land is extremely scarce in some of these communities. The Division of Community Planning identified this as a possible problem in Unalaska/Dutch Harbor, Kodiak, Seward, Yakutat, and Sitka. Also, some of these sites could be harbors for Outer Continental Shelf oil drilling activity, which would compound the community infrastructure problems created by the expansion of fishing activities. Likely candidates include Cold Bay, Cordova, Homer, King Cove, Kodiak, Seward, Unalaska, and Yakutat, although not all of these communities have expressed an interest in being OCS-support bases.

In any case, even though public sector investments cannot be made merely in the hope of drawing fish processing into the community, it will not be possible to predict the type and amount of required infrastructural investment in the absence of concrete, specific industry proposals and actions.

In addition, future planning will have to incorporate in these communities expansion of existing activities (such as salmon and crab fishing) as well as new activities (such as Outer Continental Shelf development).

PART IV
FINANCING VENTURES IN THE BOTTOMFISH INDUSTRY

Two issues affect the financing of the bottomfish industry: (1) do institutional rules prevent access to capital markets of economically sound ventures? and (2) is the level of public financial assistance adequate? In exploring these issues, this section describes the existing public assistance programs which fund fisheries-related development in Alaska and discuss the adequacy of the programs. The latter part of the section discusses Federal aid to state and local governments to help provide the infrastructure necessary to support the bottomfish industry.

Obtaining financing for a private venture in any industry depends on both the perceived profitability of the venture and the risk inherent in it, as well as the institutional rules applying to the various sources from which capital might be obtained. Experts differ over whether financing is a serious constraint on the ability of Alaska's bottomfish industry to develop. Arthur D. Little (1978) does not mention financing as a constraint on the industry. This study states that lack of capital is not a barrier, although uncertainties regarding harvesting, processing, and marketing profitability are. Combs (1978) elaborates:

> Availability of financing is less an impediment than frequently suggested; however, there is often a high order of perceived risks that influence people's willingness to seek financing for developmental fisheries for underutilized species and lender's or capital source's willingness to become involved in these projects.

On the other hand, Daniels and Klein (1979) argue that there are some capital gaps. Existing public loan and other financial aid programs available to commercial fishermen and processors are summarized in the Appendix, pages 30 and 31.

The National Marine Fisheries Service Program

There may be some difficulty in using existing programs to finance the development of a bottomfish

Table 10

Alaska Potential Bottomfish Processing Ports

Port	Estimated[a] 1979 Population	Bottomfish Processing or Definite Industry Plans[b]	Additional Population Needed[c]	Additional Public Investment[d] ($\$10^6$)	Annual Processing Capacity (10^3 MT)
Cold Bay	280	None known	2,220	$ 91.0	0
Cordova	2,780	None known	250	13.6	10
Homer	2,055	Icicle	350	14.5	10
Ketchikan	8,293	None known	180	11.7	10
King Cove	566	Peter Pan	500	42.0	30
Kodiak	5,754	NEFCO, Pacific Pearl, Alaska Packers	1,250	64.5	50
Petersburg	3,197	Icicle	NA	NA	NA
Valdez	4,481	Farm n' Sea	NA	NA	NA
Sand Point	773	None known	800	65.2	50
Seward	2,130	Seward Fisheries	360	16.7	10
Sitka	8,787	Icicle	260	14.8	10
Unalaska	619	None known	1,800	142.2	120
Yakutat	442	None known	340	22.0	20

Sources: [a] *Alaska Taxable, 1978,* and Interior Bottomfish Committee (1979).

[b] AFDC (1979), p. 29.

[c] Earl R. Combs, Inc. (1979), p. 67.

[d] Direct plus Indirect. *Ibid.*, pp. 64-67, 334-344. Combs assumes a major transshipment point at Cold Bay, fishing boat supply and maintenance at all locations, maintenance facilities for catcher/processor vessels at Seward, and dry docks at Kodiak and Dutch Harbor.

fleet. The National Marine Fisheries Service's Fishing Vessel Obligation Guarantee Program theoretically has no upper limit on the dollar amount which can be lent, although the guarantee can be at most 87.5 percent of actual cost. Since this program is run through the private banking sector, the access of the individual fisherman to loan funds may be limited by his lack of sufficient experience, collateral, equity capital (he must put up 12.5 percent of the project's cost), or his credit rating.

A common method of putting together the equity capital in such a case is by forming small consortiums and partnerships, consisting of one or more fishermen and backers. Even at current federal fund rates, however, a boat loan on a million-dollar trawler would require an average annual debt service of about $103 thousand. In addition, a banker may not believe that a trawler working bottomfish can pay this amount (see Table 5).

To further complicate matters, the Obligation Guarantee Program cannot be used for increasing the harvesting capacity in a conditional fishery—crab or salmon—in Alaska. Thus, someone building a new crabber/trawler will be only able to borrow the portion of cost attributable to bottomfish, which makes impossible cross-subsidization of bottomfishing by the crab fishery income under this program.

The Commercial Fishing Loan Program

The major state program, the Commercial Fishing Loan Program, is limited to $500 thousand per individual, which means that someone constructing a new trawler would automatically have to put together at least a partnership of two fishermen in order to qualify for sufficient funds. This program is also limited in that (1) it applies only to Alaskans with 5 years residence and (2) the program requires 25-percent bank participation. The 9.5-percent interest rate on the state portion currently makes this program the least costly to qualifying fishermen, even with the bank participation portion of the loan at rates well above the prime rate of 15-plus percent.

Other Sources of Capital

Other sources of public funds for fishermen are the Commercial Fish and Agricultural Bank, the Fishing Vessel Capital Construction Fund, and Federal Small Business Administration Guaranteed Loan Program.

The Commercial Fish and Agricultural Banks

The Commercial Fish and Agricultural Bank (CFAB) was created as a public corporation by the Alaska Legislature and anticipates beginning operations in April 1980. Anticipated interest rates are tied to the Federal Farm credit system rate, currently about 12.75 percent. Since CFAB is a cooperative, borrowers must be shareholders and purchase stock in the cooperative as a condition of borrowing. This increases the effective interest rate to the borrower.

The Fishing Vessel Capital Construction Fund

The Fishing Vessel Capital Construction Fund is a method for securing equity funds from fishing profits by deferring taxation on funds placed in a special capital construction account in the name of a fisherman or fishing business. The FVCCF is not available to nonfishermen. The basis for depreciation on the purchased vessel is reduced so that deferred taxes are paid back over the life of the vessel, without interest. FVCCF deposits from the income of the new vessel can also be used to retire debt on that vessel. The effectiveness of this program is limited by the fisherman's ability to forego the use of his current fishing income, even at tax-free rates.

Small Business Administration (SBA)

Small Business Administration guaranteed loans are available only to small borrowers who have been rejected by a bank but who still qualify under the program, a complex procedure. Guarantees are limited to either 90 percent of the loan or $500 thousand, whichever is less. This program might be more suitable for refitting or modifying vessels than for new purchases, because of the loan size limits. Current interest rates are about 16.25 percent on the guaranteed portion—about three-quarters to 1 percent over the prime rate and quite unattractive in comparison with the state's direct loan programs and the Fishing Vessel Obligation Guarantee.

The Farm Home Administration

The potential fish processor must generally look to a different group of programs. Since last year, when the Farm Home Administration set up a state office in Palmer, the FmHA Business and Industrial Loan Program has expanded substantially in Alaska, including some loans to processors. The only eligibility requirements are that the company have a majority U.S. ownership and be an acceptable market risk to a private lender. The Business and Industrial Loan Program is a loan guarantee program which guarantees up to 90 percent of principal and interest on 90 percent of the cost of the project, or 81 percent of the total. There are virtually no limits on the use of funds, and the interest rates are tied to U.S. Treasury rates, although multiple and variable rates are possible.

Small Business Loan Programs

Potential processors also could conceivably qualify for either the Federal Small Business Loan Guarantee program or the state's Small Business Loan Program. The latter is a direct loan program run by the Alaska Division of Business Loans for nonfishing businesses. The interest rate on the loans is 9.5 percent, and bank participation of 25 percent is currently required. The Small Business Loan Program is available only to Alaska residents and 100-percent Alaska-owned businesses with less than 200 employees and $10 million gross sales. The state portion of the loan may be only $500 thousand, limiting the total loan to $667 thousand with minimum level bank participation. This would only be sufficient for minor processing improvements, not for large-scale renovation or new plants. The small business may not be a subsidiary of a larger firm, so much of the heavily corporately-owned processing industry would not qualify.

Other State Loan Sources

Two other public entities can lend to processors. These are the Alaska Renewable Resources Corporation and the Alaska Industrial Development Authority, both public corporations.

The Alaska Renewable Resources Corporation

The Renewable Resources Corporation receives 5 percent of the state's royalty oil and gas revenue, up to a maximum of $250 million. This money can be used for loans and grants.

The Alaska Renewable Resources Corporation was designed to provide venture (high risk) capital for renewable resource industries. Under a policy of nonduplication, they do not make loans for boats and gear. The form of the assistance is flexible and can be in the form of grants, equity participation, or debt. Total grant assistance can be for up to 90 percent of project costs, but they are limited to the lesser of $1.5 million or 5 percent of the resources of ARRC (a limit of $500 thousand, currently) on any one project, and to no more than 49 percent equity participation in a project. The $1.5 million limit will mean that major processing investment will have to come from other sources, perhaps state or federal guaranteed debt issues, using ARRC funds as paid-in equity capital.

Alaska Industrial Development Authority

The Alaska Industrial Development Authority uses the state's power to issue tax-free revenue bonds, which yield monies that can be used for acquiring and constructing industrial or manufacturing plants. These plants are in turn sold to the company involved, which leases the plant back to the state, which in turn subleases the plant back to the firm. The company benefits from lease terms that reflect the cost of servicing tax-free debt issued in the state's name rather than taxable debt issued in the name of the firm. AIDA tax-free rates were about 7.75 percent on one recent issue when the prime rate was around 12 percent. They would be somewhat higher now.

AIDA has no statutory upper limit on the size of projects it can support. Indeed, AIDA has taken on very large projects, including a $31.5 million issue for Ketchikan Pulp pollution control and $400 million for the Pacific-Alaska LNG facility on the Kenai Peninsula. This would be adequate for any conceivable credit-worthy project and would be market-determined. The principal current limitation is for those projects between $500 thousand and $1 million in size.

Problems in Qualifying for Loan Programs

A significant feature of any of the loan programs, beside the eligibility requirements, is that most fishery loans are made with the participation of the private banking system. This is a problem in Alaska because Alaskan banks, which theoretically know the borrowers best, are generally too small to make large loans. For example, the Federal government requires that federally chartered banks have no individual loans equal to more than 10 percent of a bank's capital plus reserves. The total of these funds for all federally chartered Alaska banks as of September 30, 1979, was $79.7 million, the largest amounts being in the National Bank of Alaska with $41.5 million and First National Bank of Anchorage with $24.0 million. Since state-chartered banks are much smaller, the largest possible loan by an Alaskan bank would thus be $4.2 million, not even enough to build a large trawler or bottomfish facility. However, no prudent Alaska bank is likely to tie up anywhere near this portion of its loanable funds in a 15-to-30-year mortgage in a high-risk venture. Therefore, it is not surprising that Alaskan fishermen (especially those with a large operation) and processors go to bigger outside banking and public sources to secure funds.

Most fishing loans for Alaska, for instance, are made by two major Seattle banks. Bankers or other lenders outside of Alaska can generally be expected to have better 3-to-7-year business loan alternatives for their loanable funds than do Alaskan bankers. Therefore, even if they specialize in fisheries loans, they may be more reluctant to loan money to borrowers with economically marginal projects. Among these borrowers, there may be a perceived credit gap.

Current Outlook for Financing the Bottomfish Industry

An aggressive American entry into the bottomfish industry can probably not be accomplished at current levels of the government guarantee and loan programs. Combs (1979) calculates that total new investment in fishing vessels (including catcher-processors) would have to be about $509 million (1979 dollars) over that period, which is $51 million per year. This is roughly half again the combined size of the state and federal fishing vessel loan programs and would come on top of other expanding requirements for these programs. With the federal prohibition on loans for conditional fisheries, the state program would be especially hard hit in the beginning as fishermen seek loans for combined crabber-trawlers. At the same time, the state direct-loan program may prove inadequate to fund larger trawlers because of the $500 thousand limitation. Combs also calculates that the direct land-based processing investments would be $193.8 million between 1979 and 1984—$126.3 million in shore plants alone. If the investments appear economically viable, investments of $40 million total per year seem within range of the Alaska Industrial Development Authority. If the Authority could issue bonds for groups of small projects between $500 thousand and $1 million, and provide limited insurance of the principal and interest on marginal projects, as has been suggested elsewhere (Daniels and Klein, 1979), then direct shore plant investment would seem well served by the capital markets. No new programs should be required, but expansion of existing programs and lifting of loan size limits may be useful.

Financing Public Sector Investment

The second area in which funding help may be required is that of public facilities. As is shown in Table 11, which is based on Combs' calculation of public investment requirements, public sector investments of about $429 million (1979 dollars) would be necessary in the coastal communities shown just for the expansion of the bottomfish industry, not to mention investments required for other activities such as expanded existing fisheries or OCS oil. As is also evident in Table 11, most coastal communities will not be able to generate sufficient funds with which to build public facilities necessary to support a full-scale bottomfish industry. However, if the economics of the industry are marginal in the first place, it is unlikely that large harbor improvements could be financed with revenue bonds or other taxes on the bottomfish industry either. For example, one recent public suggestion has been that Alaska issue $300 million in revenue bonds for harbor improvements. Assuming the state actually needed to spend that amount, and allowing for tax-free rates of 8 percent on 30-year bonds, the annual debt service would be $26.4 million. Even if as many as a thousand vessels were paying off the bonds, the required annual payment per vessel would still be about $26,400. This is roughly equal to 10 percent of the annual fixed costs of an 85-foot vessel (see Table 5), and is 31 times Kodiak's current exclusive moorage rate on 85-foot vessels. It is unlikely that revenue bonds could be used on this scale, so most state money would come from either the General Fund or from state general obligation bonds.

Federal Money for Coastal Community Development

There are several sources of federal money authorized for coastal community development. For example, the Economic Development Administration (EDA) can provide several forms of aid to state and local governments for public works under the Public Works and Economic Development Act of 1965. This

Table 11

Financing for Public Investment
(millions of 1979 dollars)

Port	New Valuation ($20,000 per capita x new pop.)	"Existing" Assessed Valuation 1-1-78[a]	Total Valuation	Maximum Bonded Debt Sustainable[b]	Maximum, Less Existing Debt 7-1-78	Anticipated G.O. Debt[c]
Cold Bay	$44.4	$ NA	$ NA	$ NA	$ NA	$ 67.7
Cordova	5.0	42.7	47.7	2.6-5.3	0.5-3.2	11.0
Homer	7.0	62.2	69.2	3.7-7.3	1.3-4.9	13.0
Ketchikan	3.6	146.7	150.3	7.7-15.5	3.0-10.8	9.0
King Cove	10.0	4.7	14.7	1.4-3.0	1.2-2.8	36.0
Kodiak	25.0	141.5	166.5	9.4-18.9	5.3-14.8	60.0
Petersburg	NA	38.5	NA	NA	NA	NA
Valdez	NA	74.5	NA	NA	NA	NA
Sand Point	16.0	NA	NA	NA	NA	58.0
Seward	7.2	36.8	44.0	2.5-5.0	1.1-3.6	14.0
Sitka	5.2	230.5	235.7	12.0-24.1	4.5-16.6	12.0
Unalaska	36.0	33.1	69.1	6.3-12.6	5.7-12.0	130.0
Yakutat	6.8	4.8	11.6	1.1-2.1	1.1-2.1	18.0

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[a] *Alaska Taxable, 1978.* In the case of Sitka, city and borough data. City data in all other cases. Cold Bay and Sand Point do not have property taxes.

[b] Total, plus direct private facilities investment (Combs, 1979) multiplied by 5-10 percent, the 1978 high range ratios of G.O. Bonded Debt to Full Value.

[c] Combs, pp. 66-67.

aid must: (1) directly or indirectly improve opportunities for industrial or commercial plants and facilities or otherwise assist in developing long-term employment opportunities in the area to which assistance is given, (2) be consistent with an approved local, overall economic development plan, and (3) be reasonably related to population and economic needs of the locality. This aid can take the form of public works and facility development loans of up to 40-years maturity at federal borrowing rates, if such funds are not available on reasonable terms from private lenders and other federal agencies. Alternatively, the local government could apply for direct federal grants for public works and supplementary grants if it has exhausted its effective taxing and borrowing capacity (presumably including that available under the Alaska Municipal Bond Bank). Without supplemental aid, grants are restricted to 50 percent of project cost, and no state is allowed more than 15 percent of total appropriations under Title I of the Act. Industrial parks and sites, to be eligible for such aid, must be owned by private or nonprofit organizations and must primarily benefit the public (in contrast to projects eligible for AIDA aid, for example). Such aid can properly be used for all construction costs including land, engineering, and equipment, but not for finance and interest costs unless specifically permitted. EDA is allowed to provide technical assistance and planning aid functions to state and local entities either directly or through grants and contracts. Under Section 304 of the Act, EDA can make assistance available to supplement the basic grants and loans program. In this case, the state government must provide a 25-percent match.

State and Local Government Loan Sources

Under the State and Local Fiscal Assistance Act of 1972 and State and Local Fiscal Assistance Amendments of 1976, Federal income tax collections are shared with state and local governments according to one of two complex formulas involving population, tax effort (ratio of tax collections to personal income), and per capita income. The total to be allocated nationally started with a base of $6.85 billion, with an additional $4.8 million allocated to the noncontiguous states. The state government gets one-third of the state entitlement and the local government two-thirds. Any one locality is limited to between 66 percent and 145 percent of the average per capita distribution in that state and may not receive an amount greater than 50 percent of its revenues from other sources (adjusted taxes and intergovernmental transfers). Anti-recession fiscal assistance tied to high unemployment rates is also authorized under the Public Works Employment Act of 1976.

Should the local government decide not to seek Federal funding, it may take advantage of planning funds available for non-Federal public works projects from the Community Facilities Administration, Housing and Home Finance Agency, in Housing and Urban Development. Perhaps ironically, public housing, Federal projects, and Federal and state highways programs do not qualify. Aid takes the form of loans and no-interest advances for planning these non-Federal projects.

In the expensive area of water, waste treatment, and environmental protection, the Environmental Protection Agency runs a fairly large grants program for environmental management assistance, planning, and building treatment facilities and sewage collectors. Grants for construction of wastewater treatment works may cover up to 60 percent of costs for specific projects under section 8 of the Federal Water Pollution Control Act. Under the 1972 amendments to this act, the Federal government provides up to 75 percent of construction costs for specific categories of waste collection and treatment projects, according to a state-designated priority schedule, up to a total allotment of funds provided by Congressional appropriation. Among permitted projects are secondary treatment facilities, interceptor and collector sewer lines, pumping stations, and more exotic treatment required to meet water quality standards.

Obviously, the handful of programs mentioned above does not begin to exhaust the possible forms of Federal assistance. For example, there was no mention of funds for vocational education and manpower training, public safety, and health and social services. However, there is no comprehensive program of either Federal or state assistance to localities specifically linked to impact of fisheries development. Therefore, there may be a lack of coordination between funding sources once onshore impacts appear. In contrast, there is a Federal program for energy development impacts within the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, that could, with modification, serve as a model for either a Federal or state program in the fisheries area. The Coastal Energy Impact Program, authorized by the Coastal Zone Management Act of 1972, provides financial assistance to state and local governments to mitigate adverse onshore impacts of new or expanded coastal energy activity. The program provides:

1. Planning grants for up to 80 percent of planning costs.
2. Public facilities and public services assistance for education, environmental protection, government administration, health care, public safety, recreation, transportation, and public utilities.
3. Repayment assistance for communities and states sustaining net fiscal losses as a result of energy project impacts.
4. Environmental and recreation grants.

The primary form of assistance is credit guarantee assistance and loans to state and local government at federal interest rates, which are currently above rates available in the market to the Municipal Bond Bank or to the State of Alaska. The secondary source is a series of formula grants under section 308(b)(4)(b), refinancing and modification of terms under 308(d)(3), and formula bond retirement and repayment grants. The general features of the Act are: there must ordinarily be specific physical facility needs and that state and local credit are not available on normal terms without Federal guarantees. In more extreme cases, Federal grant assistance is indicated. Overall, this Federal program is designed to back up normal state and local financial sources. However, Table 12 shows that Alaskan coastal communities may simply not be able to repay bonds at either state or Federal rates, so it appears likely that formula grants would have to be an important feature of a fisheries impact program, no matter who ran it.

PART V
SUMMARY AND CONCLUSIONS

Several tentative conclusions can be drawn from this article on the prospects for bottomfish industry development in Alaska. They address a full range of issues concerning markets, economic feasibility of fishing and processing, economic impacts, and public support for the industry.

- While the bottomfish resource off Alaska is indeed large, the best immediate prospects for American fisheries development are concentrated on a very small proportion of the total biomass.
- It will take assured fishing productivity, substantial increases in wholesale prices for whitefish fillets and blocks, or reduction in transportation and processing costs, or all three, to make large-scale trawl fisheries for bottomfish off Alaska attractive to American fishermen.
- Quality regulations, labor productivity problems, and import quotas and tariffs may render foreign market penetration extremely difficult, making the U.S. market the best bet for Alaskan bottomfish.
- While the bottomfish fishery may provide up to several thousand jobs in the long run, it is questionable whether many of these will be held by Alaskan residents.
- Under most probable conditions, the bottomfish fishery is unlikely to provide a large new source of income to the state or adequate local tax income to pay for local infrastructure improvements currently thought necessary to support the industry in Alaska.
- If the state decides to aggressively pursue bottomfish industry development, it may have to raise its current limits on fisheries loan programs, make some minor modifications to the Alaska Industrial Development Authority regulations, and provide substantial direct funding for public facilities in coastal communities. A new Federal fisheries impact program modeled on the Coastal Energy Impact Program, but emphasizing formula grants more heavily, might help the state carry this burden.

In sum, this has not been a particularly encouraging look at Alaska's prospects for developing a new bottomfish industry. The biggest single obstacle lies in the consumer's basic resistance to paying prices that would be high enough to encourage aggressive American-based development of these species. There is no way of knowing at this time what the chances may be for greatly increased real prices. Probably the likeliest scenario is one of gradually increasing real prices and slow market penetration, which may make the bottomfish industry expansion a real possibility in 10 to 15 years. This will give Alaskans ample time to decide under what conditions they want this industry to develop.

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Appendix

Financial Aid Programs Available for Bottomfish Development

FY 1979

Program	Agency	Eligibility	Type of Funds or Assistance	Use of Funds	Maximum Amount of Funds
Fishing Vessel Obligation Guarantee: (Title XI, Merchant Marine Act of 1936)	NMFS (commercial lender)	U.S. citizens; corporations with 75% U.S. ownership.	Debt (Guarantee)	Constructing, reconstructing, reconditioning fishing vessels.	87.5% of Actual Cost (no maximum)
Farmer's Home Administration Business and Industrial Loans (Consolidated Farm & Rural Development Act of 1972)	FmHA (commercial lender)	Any legal entity with 51% U.S. ownership.	Debt (Guarantee)	Improving, developing, or financing business, industry, employment; improving economic & environmental character of rural areas.	81.0% of Cost (90% of principal and interest on 90% of cost)
Commercial Fishing Loan Program (Ak. Statutes 16.10.300-.360)	Ak. Div. of Business Loans (commercial lender over $50K)	Any individual, corporation, partnership, joint venture 100% Alaska owner-5 year Ak. residents.	Debt (Loan)	Purchase of vessels & gear & limited-entry permits; repair or upgrading existing vessels & gear.	$500K on state portion. Not to exceed 90% of value on entry permit or 75% of collateral.
Small Business Loan Program (Ak. Statutes 45.95.010-.360)	Ak. Div. of Business Loans (commercial lender over $50K)	Ak. residents. For businesses: located in state, primarily in-state business, less than 200 employees & $10 million gross sales.	Debt (Loan)	Acquire, finance, refinance, or equip small business.	$500K on state portion. Not to exceed 75% of collateral (usually 60% on equipment secured).
Commercial Fish & Agricultural Bank (Ak. Statutes 44.54.010-.250)	Ak. Div. of Business Loans (Public Corp.)	Individual fishermen, processors, marketers, coopertives, joint ventures, partnerships, corporations, 50% Ak. ownership. For fishing vessels, 100%.	Debt	Includes purchase of limited-entry permits.	Not available.
Alaska Renewable Resources Corp. (Ak. Statutes 37.12.010-.080)	Dept. of Revenue (Public Corp.)	Individuals, corporations, or other association, over 50% Ak. ownership. For individuals, 3 year residence.	Debt, Equity, Grant, Technical Assistance	Rehabilitation, enhancement, development of revewable resource industries, including research & development on technologies & markets.	Lesser of $1.5 million or 5% of resources of ARRC (currently $550K); no more than 49% of equity.
Alaska Industrial Development Authority (Ak. Statutes 44.61.010-.220)	Ak. Dept. of Commerce & Economic Development (Public Corp.)	No limits.	Lease terms	Acquiring or constructing industrial & manufacturing plants, including land, equipment, buildings, utilities, access, planning, engineering, & admin.	Market-determined (no maximum)
Alaska State Development Corp. (Ak. Statutes 44.59.010-.450)	Div. of Business Loans (Public Corp.)	All types of business.	Debt (Development Loans)	Only loans economically advantageous to the state, promote general welfare, & for which funds are not readily available on reasonable terms.	Lesser of 10% of ASDC corporate debenture debt or $750,000 per borrower.
Small Business Development Corp. (Ak. Statutes 44.60.010-.390) (Section 502. Small Business Investment Co. Act, 1958, as amended)	Ak. Div. of Business Loans (Public Corp.)	Small businesses: in food processing, less than 500 employees. Assets less than $9 million, net worth less than $4 million, average net income less than $400K.	Debt	New financing of industrial & manufacturing plant conversion, construction & expansion. Including land acquisition.	Not available.
Fishing Vessel Capital Construction Fund (Section 607, Merchant Marine Act, 1936)	NMFS, IRS	U.S. citizens who own or lease a fishing vessel of at least 5 net tons.	Deferred Federal Income Taxes	Constructing, reconstructing, or acquiring fishing vessels.	No limit. Maximum annual deposit = total of taxable income from vessel operation, vessel depreciation, net proceeds of vessel sales, earnings from CCF account.
SBA Guaranteed Loan Program	Small Business Administration (Bank Participation)	No limitations, except must meet program definition of small business.	Debt (Guarantee)	None	Lesser of 90% of loan or $500K.

Interest Rate	Terms	Fees and Restrictions	FY 1979 Size of Program		
			Total Size	Number of Loans	Avg. Size of Loan
Varies. U.S. Treasury Rates, some basis points & fees. U.S. Bond yields = 10-10.25 percent on 15-25 yr. bonds.	Up to 15 yrs. for less than $300K; up to 20 yrs. for more, 25 yrs. possible.	Vessels more than 5 net tons; Govt. holds 1st preferred mortgage ½% application fee, ¼% of balance, ¾% guarantee fee. Will finance only portion not used in conditional fishery.	$109.8 million (Natl.) approved. $5.1 million (Ak.) approved.	325 7	$338K $729K
Varies (fixed, variable, & multiple rates) & fees. Based on Treasury rates.	Up to 30 yrs. on land, buildings, permanent fixtures; 15 yrs. on machinery & equipment; 7 yrs. on working capital.	Application fee, one time 1% guarantee fee on guaranteed portion, variable rates adjusted quarterly.	$1,004.4 million (Natl.) $ 22.1 million (Ak.)	1,142 21	$711K $1,052K
9.5%, plus direct costs of servicing on state portion. No commitment fee.	15 yrs. maximum, if secured by vessels or real estate; 8 yrs. if secured by gear & equipment.	25% Bank participation on loans over $50K; residency for last 5 continuous years, 1 yr. fishing experience in last 5 yrs.	$29.7 million	357	$ 83K
9.5%, plus direct servicing costs. Fees on bank portion.	15 yrs. maximum.	25% Bank participation on loans over $50K. Small business may not be a subsidiary of larger firm.	$421 million	237	$177K
12.75% now. (Tied Federal Farm Credit Rate) Floating rate in most cases.	Not available.	Recipient must be shareholder (Class A stock). Primary income must be from fishing, agriculture, or processing. Buy Class B stock in proportion to loan.	0 (New Program)	0	0
Not applicable on all categories of financing. No statutory limit.	30 yrs. on debt financing. No others mentioned.	By policy of non-duplication, will not loan for boats or gear. Grants may be made for up to 90% of project costs. Appropriate collateral to secure financing.	$11.0 million	Approx. 250 inquiries, 50 fisheries-related.	Not avail. Size range $10K-$550K.
Varies. State tax-free borrowing rates on revenue bonds. (7.75% on recent issues, when prime rate 12)	20 yrs. typical.	Must be new construction or acquisition (may not use for refinance). Must be over $1 million.	Not available.	Not available.	Not available.
Legal contract rate plus fees, including ¼% service fee & reasonable commitment fee.	20 yrs., except not later than final maturity date of debentures outstanding.	Requires at least 10% bank participation.	Not currently making loans. Projected to be ended in 1983.		
Not available.	Maximum 25 yrs.	Not available.	Not making loans. No SBA 502 funds available.		
Not applicable (recaptured by Govt. through reduced basis for depreciating purchased vessel). Interest free.	Not applicable.	CCF account must be separate. NMFS must consent to withdrawal of funds to qualify for CCF benefits.	$234.7 million (Natl.) deposited $ 22.3 million (Ak.) deposited	1,433 depositors 229 depositors	$163.7K avg. deposit $ 97.5K avg. deposit
Variable. Currently 16.25% on guaranteed portion.	10 yrs. boats 20 yrs. real estate	1% loan guarantee fee.	$21.0 million (Ak.)	231	$ 91K

BOOK REVIEWS

***Peoples of the Coast. The Indians of the Pacific Northwest*, by George Woodcock. Indiana University Press, Bloomington, Indiana, 1977, 223 pp., index, bibliography, 16 color plates, black and white plates, clothbound, $18.95.**

This well-illustrated book deals with those Indians of the Northwest coast of North America, so justly renowned for their artistic creations, especially in monumental wood. They are represented in Alaska by the Tlingit, Haida, and Tshimshian peoples.

The book appears to have been written essentially as an historical piece, either supplemented by or as a supplement to the illustrations. Unfortunately, the historical perspective, while rich in detail, suffers from a lack of breadth and from a rather simplistic anti-white perspective. That is, for all its substantial narrative, the book does not do an objective job at presenting these interesting cultures.

A very rich bibliography has been mined to develop this work, and the scholarship is certainly adequate. We are nonetheless left with the narrative picture of people who spent all their time in colorful ceremonies, carving beautiful objects, and dancing beautiful dances.

However, one can learn much about the material culture of these peoples from this book, and the historical sequences are correct. Yet, as is true in many such works, one should not allow the anti-European attitude of the authors to interfere with both the beauty and information otherwise attainable from such a work.

***Eskimos and Explorers*, by Wendell H. Oswalt. Chandler and Sharp, publishers for University Press U.C.L.A., Novato, California, 1979, xii, 349 pp., general index, index of personal names, references, maps, illustrations, cloth, $15.00.**

Oswalt has professed a lifelong interest in Eskimos and the history of their contact with Europeans. This book communicates that enthusiasm to the reader. It covers all the major Eskimo groups from Greenland west to the Siberian coast. Though not specifically a scholarly work, it includes a substantial bibliography and is organized in a scholarly manner.

Oswalt presents his historical accounts of Eskimos sequentially and in an evenhanded, straight-forward fashion. His descriptions of Eskimo culture and life are neither romantic nor antagonistic, and the overall result is a refreshing lesson in the developing understanding of Eskimos by Europeans.

Along the way, Oswalt discusses theories about Eskimo hunting tactics and disarms some lurking misapprehensions (for example, Eskimos are usually *not* fat; most *never* lived in snow houses and were neither nonviolent nor unusually free to share things). Oswalt argues against the somewhat sanitized notion that wife sharing had some religio-social function and recognizes it (and multiple marriage) as ensuing from "simple lust."

Moreover, Oswalt makes relatively clear both similarities and differences between different groups of Eskimos. He also makes it clear that much violence between Eskimos and Europeans was Eskimo-initiated (in contrast to current popular notions that Europeans "oppressed" Eskimos). He describes how Europeans often showed great forebearance in not fighting back because of the superiority of their weapons. This was not necessarily true in Russian dealings with Eskimos. As was their want in contacts with any other group, Russians tried to enslave, collect tribute, and finally massacre the Eskimos.

Oswalt also discusses cultural affinities and probable contact of whaling Indians from the Northwest coast of North America with the Kodiak Eskimos, and discusses other intercultural contacts as well. Finally, he discusses Eskimo origin and prehistory and suggests recent works relating to contemporary Eskimos.

Oswalt is to be congratulated for producing an easily read, highly informative book on one of the most interesting peoples in the world. I highly recommend this book to anyone who would like to get not only a good overview of Eskimos, but who is pleased with fascinating detail about Eskimo life.

Arthur E. Hippler

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ALASKA

REVIEW OF

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CONDITIONS

UNIVERSITY OF ALASKA, INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH, JUNE 1980, Vol. XVII, No. 2

Alaska's Unique Transportation System

INTRODUCTION

General

Alaska's transportation needs are unique compared to those of the contiguous states. This uniqueness results from a small population being scattered across a vast, rugged area, mostly in urban coastal centers. These centers either have no highway connections to the outside or can be served by overland transportation only at considerable expense. Consequently, the dominant modes of transport in Alaska are air and marine, precisely those that play the smallest role in the domestic commerce of the contiguous states. It is only in Alaska's railbelt corridor that a variety of transport modes compete for the market.

Except for the region surrounding Fairbanks, all significant population centers in Alaska have access to marine transport, with most of the Interior having access to seasonal river transportation. Thus, this is the mode used to transport most goods into and out of the state. The pervasive nature of marine transport in Alaska is reflected in Table 1, which shows types and frequency of marine services provided selected Alaska ports. Historical trends in marine traffic through selected Alaska ports are shown in Table 2.

Because of the long distances between urban areas and the lack of direct surface transport over many shorter distances, air travel dominates in moving passengers throughout the state. It provides the only year-round access to many of the more remote areas and takes the traditional place of trucking as the primary mover of high-value items into many of these locations.

The Regional Approach

For purposes of describing Alaska's transport system, we have divided the state into three major regions: (1) the Southeastern (2) the Southcentral/Interior, and (3) the Western/Arctic. Each of these regions has, for a variety of reasons, developed a transport system whose structure is closely identified with its particular population and resource requirements. The Southeast network is primarily concerned with the forest products industry, the Western/Arctic is

The information on which this article is based was gathered for a study being performed by the Institute of Social and Economic Research for the United States Department of Transportation. Entitled "the Alaska Transportation Systems Study," the project interconnects computer simulation models of Alaska's economic and transportation systems. It uses these interconnected models to evaluate impacts of alternative transportation policies on both the operation of the state's transportation system and the patterns of state and regional development. By creating a method for systematically analyzing the interaction between economic development and transportation, ISER hopes that this study will provide a basis for informed and objective policy decisions in the transportation sphere.

To fully appreciate the need for systemwide planning for the Alaska transportation system, one must first understand the economic and geographic influences that make the system and its problems unique among the states. Thus, the purpose of this *Review* is to provide a basis for such understanding by briefly examining the Alaska transportation network and its interrelationships with the population, geography, and the economy of the state. A fuller description of the Alaska Transportation Systems Study and its results will be presented in a future issue of the *Review*.

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FEATURE

John Gray — Alaska's Unique Transportation System

John Gray is an assistant professor of transportation with the Institute of Social and Economic Research in Anchorage.

(Continued from page 1)

oriented toward fisheries, while the Southcentral/Interior is somewhat more typical of a developed economy, with a wider variety of factors influencing demand for transport. The structure that has evolved in each region is a function of both the geographic and demand constraints of the particular area.

This *Review* will look at each of the regions separately, examining within each the transportation network and the different types of transport available. It will explain how these interact with regional economic influences. Finally, it will describe which carriers and types of transport technology have been adapted to Alaska's special requirements.

First, we will look at the dominant mode of transport: marine, including carriers and ports of call. Then, we will examine other modes of transport, as appropriate. Following the discussion of the regional transport systems, we will examine the petroleum distribution system in Alaska. It deserves special treatment not only because of the importance of fuel movements to the state's economy, but also its influence on the overall structure of the transport system.

THE SOUTHEAST

Marine Transport

The predominate influence on the Southeastern marine transport system in Alaska has been the recovery, processing, and exploring of forest products. The region has several population centers of modest size, none of which is connected to any of the others by overland transport. Seven ports in the region—Ketchikan, Wrangell, Metlakatla, Juneau, Sitka, Haines, and Skagway—each normally have annual traffic volumes in excess of 100,000 tons (Table 2). Of these, only two, Juneau and Skagway, are not dominated by forest products (see Figures 1, 2, and 3, pages 6, 7, and 10).

Ketchikan

Ketchikan is the largest of the region's ports, annually handling a volume of 1.5 to 2.2 million tons. Of this amount, about 75 percent is logs, wood chips, lumber, or pulp; and about 15 percent is petroleum products, as the port is the primary fuel distribution center for the Southeast region. The remaining 10 percent consists of miscellaneous items.

Inbound shipments of commodities are transported by three major means, tankers, barges, and log rafts. Bulk petroleum comes from the U.S. West Coast and Alaska refineries in tankers of the 15,000-to-40,000-ton range. Consumer goods generally move through the port in containers brought north from Seattle by container barges. Foss Alaska Line provides this service on a weekly basis while Boyer Alaska Barge Line provides biweekly service. Both carriers use 20-foot and 24-foot containers on barges that carry about 350 units. These are transferred between barge and dock by use of forklifts. Both also carry deck cargo not suitable for container movement.

Table 1

Principal Scheduled Common Carrier Marine Services to Selected Alaska Ports

Between		**Carrier**	**Service**
Ketchikan	Seattle	F.A.L.	Weekly container barge
		B.A.B.L.	Twice monthly barge
		A.M.H.S.	Twice weekly
	Prince Rupert	A.M.H.S.	Twice weekly (October–May)
			Four times weekly (June–September)
Sitka	Seattle	F.A.L.	Weekly container barge
		A.M.H.S.	Weekly
	Prince Rupert	A.M.H.S.	Weekly
Skagway	Seattle	A.M.H.S.	Twice weekly
	Prince Rupert	A.M.H.S.	Twice weekly (October–May)
			Four times weekly (June–September)
	Vancouver	W.P.Y.	Weekly container ship
Whittier	Seattle	A.H.T.	Weekly Rail Barge
	Prince Rupert	C.N.R.	Rail barge every two weeks (September–April)
			Rail barge every ten days (May–August)
	Valdez	A.M.H.S.	Five times weekly (mid-May–mid-September)
Anchorage	Seattle	S.L.S.	Twice weekly container ship
		T.O.T.E.	Twice weekly Roll-on-Roll-off ship
		P.W.L.	Barge every two weeks (mid-March–mid-November)
		C.B.L.	Barge monthly (April–November)
Kodiak	Seattle (via Anchorage)	S.L.S.	Weekly container ship
	Cordova	S.L.S.	Monthly container ship (October–April)
			Twice monthly container ship (May–September)
	Seward/Valdez/Cordova	A.M.H.S.	Weekly
	Homer/Seldovia	A.M.H.S.	Twice weekly (May–September)
			Weekly (October–April)
Unalaska	Kodiak	S.L.S.	Twice monthly container ship
	Adak	S.L.S.	Twice monthly container ship
		F.A.L.	Container barge every three weeks
	Seattle (via Sitka)	F.A.L.	Container barge every three weeks
Dillingham	Seattle	F.A.L.	Barge; four sailings (April–August)
		P.A.L.W.	Barge; three sailings (May–August)
Bethel	Seattle	F.A.L.	Barge; three sailings (May–August)
		P.A.L.W.	Barge; three sailings (May–August)
Nome	Seattle	F.A.L.	Barge; three sailings (May–August)
		P.A.L.W.	Barge; two sailings (May–August)
Yokohama	Kodiak	S.L.S.	Container ship every three weeks
		A.P.L.	Container ship monthly
	Unalaska	S.L.S.	Container ship every three weeks
		A.P.L.	Container ship weekly

Abbreviations

F.A.L.	Foss Alaska Line
B.A.B.L.	Boyer Alaska Barge Line
A.M.H.S.	Alaska Marine Highway System
W.P.Y.	White Pass & Yukon
A.H.T.	Alaska Hydro-Train (Crowley Maritime)
C.N.R.	Canadian National Railway
S.L.S.	Sea-Land Service
T.O.T.E.	Totem Ocean Trailer Express
P.W.L.	Pacific Western Lines
C.B.L.	Coastal Barge Line
A.P.L.	American President Lines
P.A.L.W.	Pacific Alaska Line, West (Crowley Maritime)

Source: Published schedules and carrier representatives.

Industrial chemicals and minerals used in pulp manufacture are brought to this area primarily in railcars which are brought by barge from Seattle, Bellingham, and Vancouver, B.C. Crowley Maritime provides this service weekly, using barges that carry 35 to 40 railcars.

Most logs move in log-rafts and most woodchips by barge to Ketchikan from points in Southeast Alaska and Northern British Columbia.

Petroleum products are distributed from Ketchikan by barges to most points in Southeast Alaska. Processed fish is an important outbound product and is moved by container barge to Seattle either for domestic consumption or export shipment. Wood pulp leaves the area by three means: railcars to U.S. destinations, containers to Seattle for foreign shipments, or directly to the Far East by breakbulk ships.[1] Logs and lumber generally move directly to the Far East via breakbulk ships.

Sitka

Sitka, like Ketchikan, is the location of a major pulp-processing facility. It also receives industrial chemicals and minerals by railcar barge from western locations and ships pulp to the lower U.S. by the same means. The railbarge carrier, Washington Tug and Barge, uses barges with a capacity of 25 to 30 railcars. Logs are moved to Sitka in rafts while woodchips normally arrive in barges. Both are moved by a number of independent operators. Most pulp shipped out of Sitka is destined for Japan and moves via breakbulk shipping.

Foss, with its weekly container barges, is the principal carrier for other inbound consumer and construction goods. Petroleum products, mostly from Ketchikan, are shipped via fuel barges.

Sitka also serves as a transshipment facility for cargo moving between Seattle and the Aleutians. Foss provides this service every three weeks.

Outbound goods, principally seafood, usually go to Seattle by Foss container barge. Total annual throughput averages 750,000 to 1 million tons.

Wrangell, Metlakatla, and Haines

Wrangell, Metlakatla, and Haines are timber ports. The only significant quantities of any commodities passing through these three ports are inbound rafted logs and outbound logs and lumber. Export of these products is almost entirely to the Far East via breakbulk shipping. All three ports receive petroleum principally by barge from Ketchikan. For consumer and construction-type commodities, Wrangell is

Table 2

Total Traffic for Selected Alaska Ports:

Historical Trends

(in thousands of short tons)

Ports	1977	1976	1974	1972	1970	1968	1966
Ketchikan	2,168	1,559	2,162	2,186	1,868	1,881	1,542
Metlakatla	224	174	318	291	117	70	15
Wrangell	656	827	1,023	1,169	1,181	755	502
Petersburg	67	56	205	157	294	134	114
Sitka	553	998	970	1,243	916	1,009	1,072
Juneau	152	167	154	201	119	126	133
Skagway	1,026	833	1,514	1,388	1,273	575	297
Valdez	10,667	507	357	254	478	182	188
Cordova	36	66	35	42	34	44	57
Seward	115	237	72	62	29	117	49
Homer	126	31	12	170	190	17	14
Whittier	414	457	662	646	349	312	N/A
Anchorage	2,220	2,932	2,340	2,058	1,937	1,311	1,009
Kodiak	501	388	217	193	124	109	213
Unalaska	325	350	157	190	252	121	171
Bethel	96	110	41	N/A	N/A	N/A	N/A
Nome	64	30	32	43	21	41	47
Bristol Bay	71	59	12	34	169	26	61

Source: U.S. Army, Corps of Engineers, Waterborne Commerce of the United States, Part 4.

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[1] A ship (or barge) of conventional design used for transport of non-containerized general cargo below or above deck.

served weekly by Foss container barges. Containers bound for Haines and Metlakatla are transferred to the State Marine Highway System ferries at Juneau and Ketchikan, respectively.

Juneau

Juneau is one of the two ports in the Southeast not involved in the movement of forest products. Since the city has no industry, the port's only purpose is to provide products for local consumption. Petroleum arrives via small tankers and barges from the U.S. West Coast and Alaska distributors, while most other commodities are brought north by the Foss container barge service. As the port is presently the northern terminus for this operation, it also serves as a transshipment point for products bound for Haines and Skagway via the Marine Highway.

Skagway

Skagway is influenced by factors which make it unique in Alaska. As the primary port for the Yukon Territory, the demands for its service have almost no relationship to Alaska conditions. Further, most of its facilities are privately owned by White Pass and Yukon Limited, a multimodal Canadian transport firm. WP&Y operates two small container ships, *Frank H. Brown* and *Klondike*, between Vancouver, B.C. and Skagway. [2] A narrow-gauge railroad and a pipeline are operated between Skagway and Whitehorse, Yukon Territory. Extensive trucking services are also provided in the Yukon and northern British Columbia. In addition to its container transfer facilities in Skagway, the company also operates a bulk ore terminal.

Skagway itself generates little demand for shipping. However, the total throughput of the port is in the range of 800,000 to 1,500,000 tons annually. Of this, about 50 percent will generally be copper, lead, and zinc concentrates destined for the Far East, and 20 percent will be bulk materials handled in containers for movement south to Vancouver. Of the remainder, about two-thirds represents inbound petroleum products from Vancouver distributors and one-third is inbound containerized general cargo.

Skagway's local consumption needs are primarily satisfied by containers brought from Juneau by the state Marine Highway System and by petroleum barges from Ketchikan.

Petersburg

Petersburg is an important smaller port. It is the largest seafood processing center in the region and produces considerable tonnages of this high-value commodity for movement via Foss container barge to Seattle. The port also ships a limited amount of lumber and some logs in rafts from the surrounding area to Southeastern mills. When the local timber harvesting operations are working at full capacity, Petersburg will usually move considerably more than 100,000 tons.

There are numerous smaller ports in the region, primarily engaged in shipments of logs or fish. Most are served by feeder barges from the larger centers, although occasionally a mainline container barge will call at one of them for a major shipment. Collectively, they have an annual throughput of about 1.0 to 1.5 million tons, with log movements constituting 90 percent of this amount.

The Marine Highway

The Alaska Marine Highway system ties together the entire Southeastern region. The mainline vessels of the state's fleet serve Ketchikan, Wrangell, Petersburg, Sitka, Juneau, Haines, and Skagway. The mainland routes also extend south to Prince Rupert, B.C. and Seattle. In addition, Metlakatla, Hollis, Kake, Angoon, Tenakee, Pelican, Hoonah, and Glacier Bay are connected to the mainland routes by feeder services. Traffic on the system is primarily passenger and private vehicle; it is highly seasonal, with tourist traffic crowding the vessels in the summer.

Some freight is moved from Seattle and Prince Rupert to various Southeast locations. As was noted earlier, freight traffic is particularly important on the routes north of Juneau and between Ketchikan and Metlakatla. Mainline service frequency calls for twice-weekly departures from each of the southern terminals during the winter, with summer traffic increasing the Prince Rupert departures to four per week. Most feeder service is once or twice per week, depending upon the season. During 1977, the system carried 195,000 passengers and 50,000 vehicles, while the volumes for 1978 were 222,000 passengers and 54,000 vehicles. The most heavily patronized route segments were Wrangell-Petersburg and Juneau-Haines. The busiest ports were Juneau, Haines, and Prince Rupert in both years (Table 3).

There were four mainline vessels serving the Marine Highway System: *Columbia, Matanuska, Malaspina*, and *Taku*. The largest and newest of these is *Columbia*, which usually operates out of Seattle. Two older rebuilt vessels, *Matanuska* and *Malaspina*, run either from Seattle or Prince Rupert while the smallest of the four, *Taku*, operates almost exclusively from Prince Rupert. Of the three smaller feeder vessels, *Chilcat* operates between Ketchikan, Metlakatla, and Hollis, while *Le Conte* and *Aurora* serve the towns of Petersburg, Kake, Juneau, Sitka, Angoon, Tenekee, Hoonah, Pelican, Haines, and Skagway, with *Aurora* also scheduled into Ketchikan, Hollis, and Prince Rupert.

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[2] WP&Y also operated the world's first cellular container ship, *Clifford J. Rogers*, which entered service in 1955 and was retired in 1966.

Figure 1

Major Inbound Commodity Flows 1977

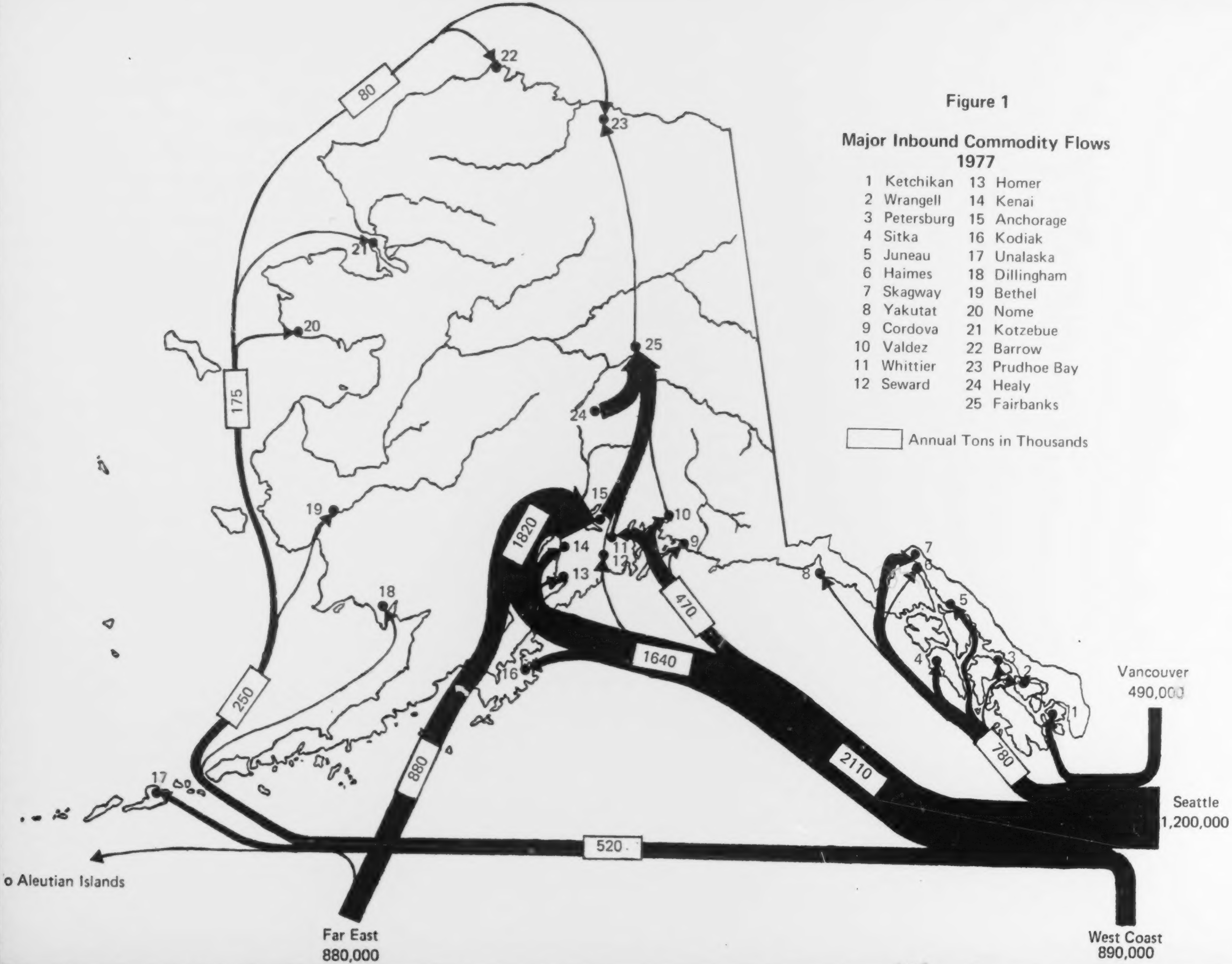

1 Ketchikan
2 Wrangell
3 Petersburg
4 Sitka
5 Juneau
6 Haimes
7 Skagway
8 Yakutat
9 Cordova
10 Valdez
11 Whittier
12 Seward
13 Homer
14 Kenai
15 Anchorage
16 Kodiak
17 Unalaska
18 Dillingham
19 Bethel
20 Nome
21 Kotzebue
22 Barrow
23 Prudhoe Bay
24 Healy
25 Fairbanks
Annual Tons in Thousands
80
175
250
1820
470
1640
2110
780
880
520
Vancouver 490,000
Seattle 1,200,000
West Coast 890,000
Far East 880,000
o Aleutian Islands

Figure 2

Major Outbound Commodity Flows 1977

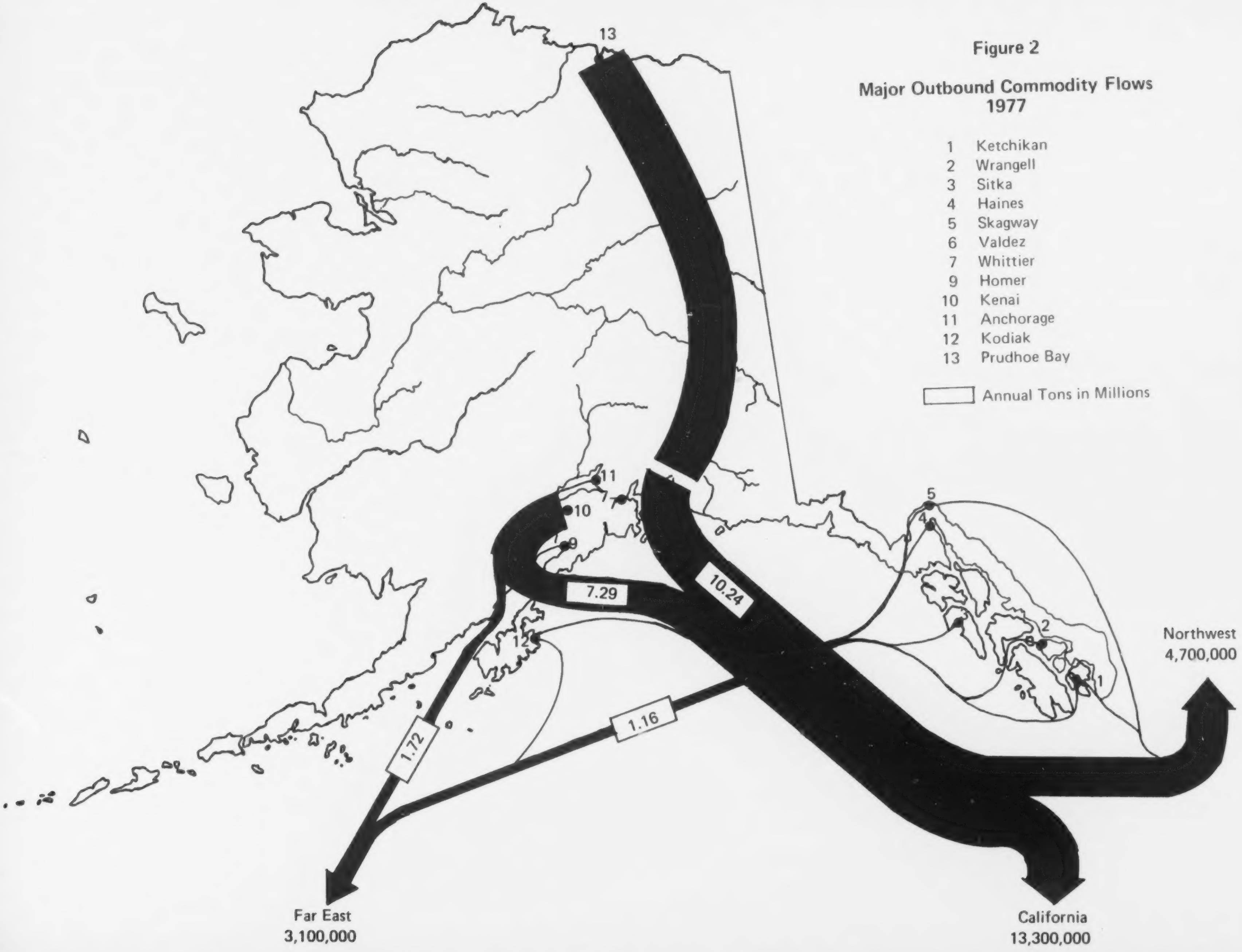

1 Ketchikan
2 Wrangell
3 Sitka
4 Haines
5 Skagway
6 Valdez
7 Whittier
9 Homer
10 Kenai
11 Anchorage
12 Kodiak
13 Prudhoe Bay
Annual Tons in Millions
13
11
10
7
9
12
5
4
2
8
1
7.29
10.24
1.72
1.16
Northwest
4,700,000
Far East
3,100,000
California
13,300,000

Table 3

Marine Highway System

1978 Southeast Passenger Origins and Destinations

Origins

Destinations	Seattle	Prince Rupert	Metlakatla	Ketchikan	Hollis	Wrangell	Petersburg	Kake	Sitka	Angoon	Tenakee	Hoonah	Juneau	Haines	Skagway	Glacier Bay	Pelican
Seattle		41		2,063		434	710		997				3,373	5,187	2,330		
P. Rupert	10			8,067	162	772	1,136		454				3,872	7,839	3,108		
Metlakatla				6,463													
Ketchikan	3,483	8,991	7,277		4,150	2,039	2,123	54	655	23		1	2,803	952	552		
Hollis		161		4,108		162	64	2	17	36		7	5				
Wrangell	476	714		2,697	33		1,770	18	404				1,007	350	106		
Petersburg	848	1,074		2,366	35	2,171		1,694	1,094	40	3	23	2,878	745	225		
Kake				57	1	18	1,625		322	215	4	60	154	9	4		
Sitka	156	714		603	9	357	1,172	394		881	111	635	3,439	1,146	800		
Angoon				53	36	1	18	124	932		9	203	782	31	2		
Tenakee						3	7	4	88	5		4	640	1			
Honnah				1	4	1	29	42	662	159	6		2,556	167	27	45	49
Juneau	4,023	4,528		3,209	31	1111	3,200	176	2,940	743	619	2,263		12,124	5,949	516	363
Haines	5,838	6,020		977	3	344	649	46	659	65	9	64	11,694		6,192		5
Skagway	5,750	2815		799		129	235	19	368	15		21	6,492	6226			1
Glacier B.												45	516				
Pelican												57	376				

1978 Southeast Vehicle Origins and Destinations

Origins

Destinations	Seattle	Prince Rupert	Metlakatla	Ketchikan	Hollis	Wrangell	Petersburg	Kake	Sitka	Angoon	Tenakee	Hoonah	Juneau	Haines	Skagway	Glacier Bay	Pelican
Seattle		25		795		261	238		457				946	1,979	151		
P. Rupert	15			2,180	62	244	317		93				1,053	2,852	290		
Metlakatla				1,423													
Ketchikan	1,043	2,503	1,372		1,295	376	297	2	165			3	428	293	28		
Hollis		59		1,340		13	13		6	1			6		1		
Wrangell	218	261		531	8		464	3	60				139	72	10		
Petersburg	269	350		357	12	517		182	291	4		7	569	213	21		
Kake				7	1	2	212		85	10		8	40	2			
Sitka	85	234		125	3	54	336	94		96	1	59	672	331	392		
Angoon				2	2		4	2	100			28	135	4			
Tenakee																	
Hoonah				1	2	1	3	2	54	10			401	43	4		
Juneau	1,506	1276		478	15	195	610	45	623	130		356		3,702	776		16
Haines	2,450	2,301		287		71	161	4	160	6		16	3,532		1,009		
Skagway	467	293		289	1	22	24		37				958	1,057			
Glacier B.																	
Pelican													15				

Source: Alaska Marine Highway System; Annual Traffic Volume Report-1978.

Roads and Highways

Roads and highways in the region are very limited in scope, mostly being only local service or logging roads. Two exceptions to this are the Haines Highway which runs 154 miles north to join the Alaska Highway in the Yukon Territory and the newly completed Skagway-to-Whitehorse highway paralleling the White Pass and Yukon Railway between these points.

Paralleling the Haines Highway is an out-of-service military petroleum products pipeline which runs through Canada to Fairbanks. Another highway important to the Southeast is Canadian Highway 16 from Prince Rupert eastward to Prince George and Edmonton. At Prince George it connects with Highway 97 to Vancouver and Seattle (Figure 4, page 20).

Air

Air service is the primary means of connecting the region to the remainder of the state and nation for passenger travel (Figure 5, page 24). For this mode, Juneau with its significant population and concentration of government offices is the center. Airports capable of handling jet aircraft up to the size of a Boeing 720 or 727 are located in Yakutat, Gustavus, Juneau, Sitka, Petersburg, Wrangell, and Ketchikan. Extensive commuter service is operated from Juneau to smaller towns in the northern part of the area, with a more limited number of commuter routes radiating from Ketchikan to the southern panhandle.

Alaska Airlines, the largest carrier in the region, serves all of the airports noted above with Boeing 727 aircraft. Gustavus receives only summer service from Juneau—mostly for tourist traffic. Frequency of service to most locations varies by season but is usually three or four flights per day between Juneau and Anchorage; one to two daily to Sitka; three or four daily between Ketchikan, Juneau, and Seattle; and once daily to other towns.

Wien Air Alaska, the second major airline in the region, connects Juneau and Ketchikan to Anchorage, Whitehorse, and Seattle. Wein's schedules also vary seasonally, but generally include one or two daily flights on all routes except Juneau-Whitehorse, which receives twice-weekly service. The most heavily traveled commuter routes in the region are those between Juneau, Haines, and Skagway. During the summer almost hourly service is provided, while winter schedules are three to four flights dailv

THE WESTERN/ARCTIC

Geographically the largest and demographically the smallest of the state's transport regions, the Western/Arctic is like the Southeast in that a single resource commodity has been the principal influence shaping its transport structure. In the Western/Arctic, the catching, processing, and exporting of seafood has evolved the transportation network. Like the Southeast, this region is not served by any overland modes of transport except for a few local access roads. Distances between the few small population centers that do exist are greater than for any other part of the state.

Marine Transport

Only two ports in this area, Kodiak and Unalaska, have traffic volumes normally exceeding 100,000 tons (Table 2). Other areas with significant activity include the Bristol Bay basin, Bethel, Nome, Kotzebue, and Barrow. Each of these has a service area of considerable geographic size. In addition, there are many ports, mostly seasonal, usually established to support either fishing or the import of subsistence goods for local residents.

Kodiak

Kodiak is the largest of the region's ports, handling an annual volume of 200,000 to 600,000 tons. Of this amount, about 30 percent is petroleum products for local consumption, received by tanker and barge from both West Coast and Alaska points. The port is also the home of one of the nation's largest fishing fleets. The port's largest single commodity category is seafood products, with inbound unprocessed fish comprising about 15 percent and outbound processed products comprising about 25 percent of the total volume. The port serves as the major transshipment point for goods bound for Southwestern Alaska, and thus, the remaining 30 percent represents a considerable volume of general cargo.

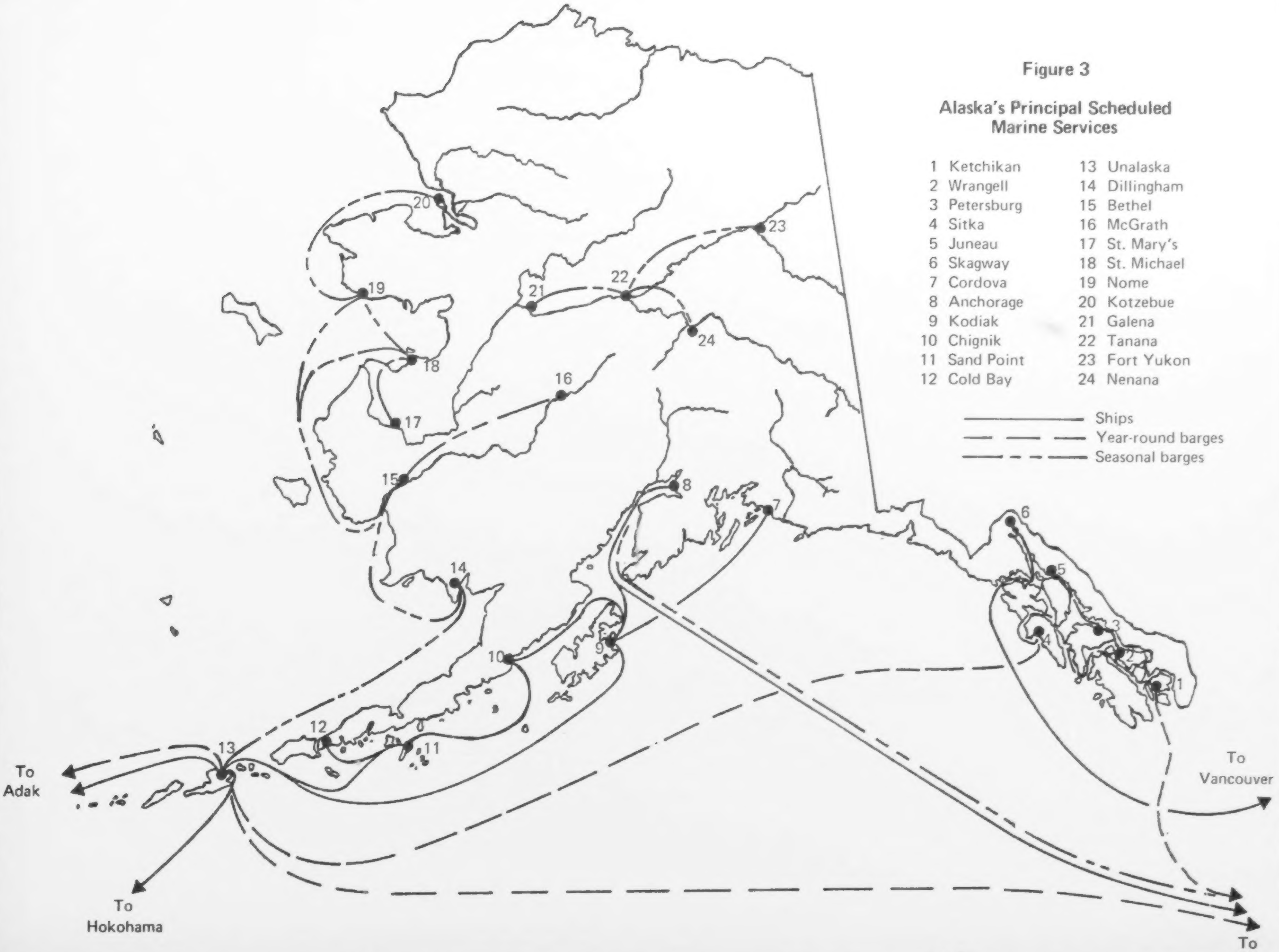
Sea-Land Service calls at Kodiak weekly with container ships from Seattle via Anchorage. Cargo is transferred from this mainline service to a small ship, *Aleutian Developer*, which can carry ninety of Sea-Land's 35- or 40-foot containers. This ship operates on a biweekly schedule between Kodiak and Cordova, Unalaska, Adak, and many smaller ports along the Alaska Peninsula.

Seafood exports to Japan are transported by container ships operated by Sea-Land and American President Lines. Sea-Land has constructed a new ship, *Boxer Captain Cook*, with a capacity of 280 containers, designed specifically for this trade. Schedule frequency is every three weeks. American President Lines provides monthly cargo pickup at Kodiak, using its ships from the Seattle-Japan route. For this service, APL uses "Pacesetter Class," ships with a capacity of 590 40-foot containers.

Tug and barge operators from Kodiak provide local cargo transport service to Kodiak Island, the Alaska Peninsula, Bristol Bay, and the Aleutians. Some

Figure 3

Alaska's Principal Scheduled Marine Services


1 Ketchikan
2 Wrangell
3 Petersburg
4 Sitka
5 Juneau
6 Skagway
7 Cordova
8 Anchorage
9 Kodiak
10 Chignik
11 Sand Point
12 Cold Bay
13 Unalaska
14 Dillingham
15 Bethel
16 McGrath
17 St. Mary's
18 St. Michael
19 Nome
20 Kotzebue
21 Galena
22 Tanana
23 Fort Yukon
24 Nenana
Ships
Year-round barges
Seasonal barges
To Adak
To Hokohama
To Vancouver
To

logging is done in the area and export of logs and lumber to Japan takes place mostly by foreign breakbulk shipping.

Unalaska

Unalaska is the largest port in the Aleutian Islands and handles about half the volume of Kodiak. It is the principal petroleum distribution point in the region and, as such, now has a throughput of about 275,000 tons of petroleum products per year. These are generally received from West Coast and Alaska refineries directly by small tankers. Like Kodiak, its other significant commodity is seafood. It has become an increasingly important seafood processing center and is presently almost equivalent to Kodiak in value of cargo, although somewhat lower in total tonnage.

The port does a limited amount of transshipment work. Most of this is related to seafood traffic, particularly that involving transfers to *Aleutian Developer* from barges operating in Bristol Bay and Kuskokwim Bay. Crowley Maritime is particularly active in this trade, operating a service called the "Salmon Barge" into Bristol Bay in conjunction with Sea-Land. Foss Alaska Lines also serves Unalaska, using container barges which connect with their Southeast service at Sitka. Direct export service for seafood to Japan is offered weekly by American President Lines and every three weeks by Sea-Land.

Adak and Shemya

Adak and Shemya are the most active ports in the western part of the Aleutian Island system. Both are primarily used to service adjacent military installations (U.S. Naval and Air Force Stations, respectively), although Adak is becoming an increasingly important center for the shipment of seafood. Each port has an annual throughput of about 25,000 tons, with the largest component part for each being fuel. Adak is served every other week by Sea-Land's *Aleutian Developer* and every three weeks by Foss container barges. Service to these ports and others in the islands is also provided by barges under contract to the military. Crowley Maritime is currently responsible for this operation.

Bristol Bay

The aggregate traffic in Bristol Bay is fairly high; however, no single port dominates the area. Two have significant volumes: Naknek and Dillingham. Most of their traffic is related to the seafood industry, although Naknek also serves as the port for the King Salmon Air Force Station. Outbound seafood is mostly taken to Kodiak or Unalaska for processing, although the value of some species has made air movement to Anchorage for processing and transshipment increasingly attractive. Petroleum is received by barge, primarily from distributors in Unalaska, with lesser amounts coming directly from the West Coast.

Almost all movements in Bristol Bay are by barge. Foss Alaska Lines provides four sailings yearly from Seattle to Dillingham. The first of these, in mid-April, brings mostly cannery supplies. Crowley Maritime provides thrice-yearly service to the area as part of their Pacific Alaska Lines-Westward system. Considerable contract barge service is also available, mostly related to the seafood industry or the military.

Bethel

Bethel is the only Alaska river port capable of receiving ocean-going barges. In fact, one of the primary reasons for the town's existence is its location at the head of deep draft navigation on the Kuskokwim River, which makes it a distribution center for the Lower Kuskokwim and a transshipment point for the traffic moving upriver. Total annual tonnage is between 75,000 and 100,000, with about 50 percent of this being petroleum products. Most of this is received by barge from Unalaska, with about one-third transshipped for movement to various points up the river, principally McGrath at the head of river navigation. The major outbound commodity is fish, which is moved by barge to processing points in Alaska and further south. Both Crowley and Foss have three yearly trips scheduled into Bethel, while additional contract service is available from both of these carriers and other operators. Transport on the Kuskokwim River is provided by United Transportation using shallow-draft general cargo and fuel barges of 300-to-500-ton capacity.

Kotzebue and St. Michael

Kotzebue and St. Michael are two other West Coast ports providing transfer service between ocean and river carriers. Kotzebue handles about half the total cargo volume of Bethel and is the transshipment point for goods moving up the Kobuk. Its principal commodities are inbound petroleum products by barge from Unalaska and outbound fish to various processing points. Crowley Maritime usually provides two scheduled trips per year from Seattle. Additional service is usually on a contractual basis. St. Michael is the transshipment location for freight moving into the lower Yukon River area. About 7,500 tons are transferred annually for shipment to points on the lower Yukon, with the St. Mary's area being the principal destination. Petroleum traffic represents the majority of the business. Crowley makes two annual scheduled calls at St. Michael while Foss will stop to make deliveries from their three Bering Sea sailings if cargo is available. The river carrier operating from St. Michael is Black Navigation.

Nome

Nome is the principal port of the Norton Sound area. Handling about 75,000 tons per year, it is the distribution center for the area and has significant volumes of most commodities. However, like most other ports in the region, its largest item is petroleum products, which comprise about two-thirds of the total throughput. Formerly having very little outbound traffic, Nome is becoming a fairly important summer fishing port with the expansion of domestic Bering Sea Fisheries. Crowley makes two scheduled trips annually into Nome, while Foss makes three.

Barrow

Barrow is the nation's northernmost port. It is a small port with almost no outbound cargo. Inbound items are entirely for the subsistence of the residents. Of this, almost 80 percent is petroleum products. Barrow is served by Crowley, with a frequency of only once or twice yearly, due to ice conditions in the Arctic Ocean.

Other Small Ports

Like the Southeast, the Western/Arctic region has a large number of small ports scattered along the coast. In this region they are generally smaller and further apart. Their commodity volume distribution tends to be much like that of the larger centers. The total for all the smaller ports is about 100,000 tons with 65 percent being petroleum products and 20 percent being seafood. Much of the cargo destined to the smaller communities around Norton Sound and the Chuckchi Sea is delivered by Arctic Lighterage Service. This service operates from bases in Nome and Kotzebue, where it makes connection with the mainline carriers. These smaller ports as well as many larger ones are served by two operations unique to this area.

"Cool Barge" is a service operated by Crowley Maritime under contract to the Department of Defense. Its original purpose was to provide summer barge service to isolated military stations along the Alaska coast. It gradually expanded to include other federal and state activities in remote areas and later to all communities in the Western Coastal Region. Service is provided both "over the beach" and to fixed facilities, and includes both petroleum products and general cargo. During the 1979 season "cool barge" called at eighty-three locations, with its largest customer being the Native Health Service.

Another unusual service is that offered by the Bureau of Indian Affairs. A modified 1945 "victory" ship, *North Star III*, makes two trips a year from Seattle to the western coastal villages of Alaska. On the first trip, the *North Star III* moves freight as far north as Norton Sound; on the second trip it transports cargo from Seattle to ports north of Norton Sound to Barrow. The ship can carry 5,000 tons of general cargo and 4,000 tons of bulk petroleum products. It also carries four landing craft, each having a 35-ton capacity (with one modified to handle bulk petroleum) for lighterage to village beaches. The longer-term expectations for this service are somewhat clouded, as the ship has expended most of its useful life. Whether it will ultimately be continued using another vessel or converted to a contract tug and barge operation similar to "cool barge" is undetermined at this time.

A major influence on traffic patterns in much of this region is the seasonal nature of marine access. North of the Alaska Peninsula, most ports are closed by ice during part of the year. This period ranges from 3 to 4 months in the lower Bristol Bay to 10 to 11 months at Barrow. In addition, most of the regional ports do not have fixed loading and unloading facilities available. This requires that cargo for these points be lightered ashore in small lots for beach transfer. This is true even at larger locations such as Barrow. The fixed facilities at Nome and Kotzebue can accommodate only the smallest vessels. The net effect of these constraints is to make marine transport much more costly in this region than it is in more settled and accessible areas.

Air

Because of the long distances involved, air travel is much more dominant in this region than in the Southeast. Major locations having the capability to handle jet aircraft include Kodiak, Cold Bay, Unalaska, Adak, Amchitka, Shemya, King Salmon, Dillingham, Bethel, Aniak, McGrath, St. Marys, Unalakleet, Nome, Kotzebue, Barrow, and Galena. Cold Bay is the center for Alaska Peninsula-Aleutian Islands service, while Bethel, Nome, and Kotzebue are hubs for widespread local commuter service. Three major carriers and a number of smaller carriers serve the region. Air route connections from this area to the remainder of the state take place through Anchorage for Kodiak, Bristol Bay, the Aleutians, and Bethel and via Fairbanks and Anchorage for Nome, Kotzebue, and Barrow.

Due to the sparseness of the regional population, a relatively high percentage of freight flows both into and out of the area by air. In many of the more remote villages, even though they are on the coast, considerably more than half of all goods consumed therein may arrive by air. At points where the marine alternative is not available or can be considered only briefly in a short season, all items may well arrive by air. Depending on the origin and destination of shipments and the value of goods, air tariffs may well be competitive with marine.[3] This has proved to be particularly true for the high-value seafood species originating in areas north of the Alaska Peninsula. For this part of the region, access by direct shipping to the Far East or West Coast may take 10 to 20 days. In such cases, where freshness of the product is a prime determinant of market value, it is frequently more economical to use air freight directly to Anchorage.

Wien Air Alaska, the largest carrier in the region, is based in Anchorage, the center of most of the company's service. From this base, Wien provides once or twice daily service to Bethel, Dillingham, King Salmon, Kodiak, Kotzebue, and Nome, with thrice weekly scheduled flights to Aniak, Galena, McGrath, St. Marys, and Unalakleet. There is daily air service from Fairbanks to Barrow and Kotzebue and once or twice weekly to Barter Island, Galena, McGrath, and Nome. There is only limited demand for movement between towns in the region, and thus the only intraregional mainline service is incidental to the Anchorage or Fairbanks routes provided by Wien. Most flights use Boeing 737 aircraft, often with only limited seating in order to accommodate greater quantities of freight than would be the case in more populated areas. In addition to the intrastate routes, Wien has recently begun direct, four-times-weekly service between Kodiak and Seattle.

Besides the mainline routes, Wien also maintains a network of bush commuter routes with actual service usually contracted to local operators. These are centered in Barrow, St. Marys, Nome, Kotzebue, Bethel, and Galena and have service frequencies of one to five times weekly. For many of the communities served, particularly in the interior locations, these flights often represent the only contact with the outside world and are the source of all goods consumed by the local residents. Wien is a major freight carrier to remote areas. During 1978 the airline moved 33,000 tons of freight out of Anchorage International Airport, most of it to the bush.

The two other major airlines serving the region are Reeve Aleutian Airways and Great Northern Airlines. As the name would imply, Reeve provides service to Cold Bay and all major locations in the Aleutian Islands and Alaska Peninsula with its fleet of Lockheed Electras. It provides once- or twice-daily flights between Anchorage and Cold Bay and Unalaska with less frequent flights from Cold Bay to the other island locations. Reeve also flies between Cold Bay and Seattle two or three times weekly. In 1978, the airline moved 2,500 tons of freight out of Anchorage to the Aleutians and brought back 1,100 tons, mostly fish. Great Northern is a major carrier that moves freight into and out of the region, particularly to and from Nome, Kotzebue, and Unalakleet. In 1978, it moved 28,000 tons of freight from Anchorage to all areas of the state, but mostly to the western and northern areas. It brought back 6,000 tons, primarily seafood, mostly from Bristol Bay. This company also uses Lockheed Electra aircraft. In early 1980 the company announced plans to merge with Alaska International Airlines, a Fairbanks-to-Prudhoe Bay carrier, to form Alaska's largest intrastate airline.

The Marine Highway

The only other transport mode important to the area is the State Marine Highway System which connects Kodiak with the Southcentral ports of Homer and Seward. Frequency is once per week to each and it is used primarily by passengers with vehicles, especially for recreational purposes. The vessel used on this run is *Tustemena*. Twice in the spring and fall of each year she also makes runs down the Alaska Peninsula to Sand Point and King Cove.

THE SOUTHCENTRAL/INTERIOR

This region contains the majority of the state's population and economic activity. Accordingly, it has the most diverse transportation system and is the only area of the state where overland modes play a significant role. This is the region which most closely approximates the contiguous states in the manner in which its network has evolved. The economy is diverse, with many more sectors having a significant impact than is the case in either the southeast or Western/Arctic. In addition, this area has sufficient population to support rudimentary service sectors, which make for a more diverse commodity flow—much more so than elsewhere in the state. It has five major seaports, three significant lesser ones, a river port, a rail and highway network, and extensive air service tying together all principal population centers.

Marine Transport

Valdez

Valdez is the state's largest port in terms of total annual tonnage (Table 2). As the southern terminal of the Trans-Alaska Pipeline, and the nation's only superport, it is capable of handling most American-registered tankers presently afloat. Annual throughput is presently about 60 million tons, with 99 percent of this being crude petroleum en route to the West Coast or Alaska refineries, or for transshipment to the U.S. East Coast via the Panama Canal. Most of the petroleum is moved in tankers operated by the North Slope oil companies. Typical of the ships used in this service are *Arco Juneau*, 121,000 tons; *B.P. Alaska*, 189,000 tons; and *Arco Sag River*, 70,000 tons. In addition to the crude oil, about 400,000 tons of petroleum products move to or through the Valdez port, which is a major distribution point for two companies transshipping the commodity to both coastal and inland points throughout Southcentral and Southeast Alaska. Little else presently moves through the port; however, the city expects to begin construction of a container terminal in 1980. The port also has facilities for movement of rail cars from barges to local destinations. However, these have not been used since completion of the pipeline terminal. During the construction period, this service was provided from Whittier by Crowley Maritime. In early 1980, Pacific Western Lines announced that they would inaugurate monthly barge service between Valdez and Seattle in April 1980, giving the port its first scheduled service since the 1964 earthquake.

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[3] This competitive condition frequently results from a large portion of goods being shipped into remote areas by air as parcel post rather than under normal airfreight tariffs.

Kenai

The Kenai area has the second largest port complex in the state. Like Valdez, outbound crude petroleum is its principal commodity. However, since the area is also a refining and petrochemical center, it is not so dominated by crude oil as is Valdez.[4] Kenai has a total annual throughput volume of about 10 million tons, of which almost 70 percent is crude oil. Unlike Valdez, more than 400,000 tons of this commodity is imported, mostly from the Far East, to be processed into chemicals for re-export to the Orient. Of the remaining total tonnage, about 5 percent is outbound chemical fertilizer and 25 percent is outbound petroleum products. The latter are shipped to points throughout Alaska, to the West Coast, and, in the form of liquefied petroleum gas, to the Far East. The fertilizer is shipped by Crowley Maritime's Pacific Alaska Lines, which uses two custom-built 12,000-ton barges to transport the material from Nikiski to Portland, Stockton, and Sacramento, making a minimum of twenty trips per year. A large component of the outbound marine petroleum products movement, that going to Anchorage, ceased in late 1977 with the completion of a 10-inch pipeline between the two points. In addition to petroleum, the port handles about 75,000 tons of general cargo, mostly related to off-shore oil exploration and operations. The only carriers serving the port are contractors serving the oil or petrochemical industries. No scheduled operations call at the port.

Anchorage

Anchorage is Alaska's largest general cargo port. Annual freight volume is currently at about the 2-million-ton level. Of this, about 40 to 45 percent is petroleum products inbound from the West Coast and Far East. However, the volume of petroleum is declining both as a percentage of the total and as an absolute amount as the state becomes increasingly self-sufficient in its fuel requirements and a greater proportion of the total demand is supplied by the Nikiski Pipeline. Conversely, general cargo movements should continue to increase in volume, both absolutely and proportionately. About 90 percent of the general cargo is inbound and most of this is brought to the port on container or roll-on-roll-off ships operated from Seattle or Tacoma. Sea-Land provides twice weekly service using three ships, each with a capacity of 360 containers. These are *Portland*, *Philadelphia*, and *Newark*. Totem Ocean Trailer Express provides twice weekly service with two roll-on-roll-off ships, *Great Land* and *Westward Venture*, each with a 410-trailer capacity. The remaining freight generally consists of bulk construction material brought from Seattle by barge. This is transported by Pacific Western Lines, which provides biweekly summer service, and by Coastal Barge Lines which sails monthly during the construction season. Of the general cargo, consumer merchandise represents about 35 percent and food products about 25 percent. The remainder is composed of a variety of construction and consumer items. Outbound materials are similarly diverse.

Of the products moving into the Anchorage port, about 60 percent are destined for Anchorage with the remainder having destinations throughout the region. The city-owned port is a modern, highly efficient facility with two container/roll-onroll-off berths, with one berth used for general cargo, petroleum, or bulk. In addition, there are several privately owned facilities.

While not ice free in the winter, Anchorage harbor is navigable by non-ice strengthened, self-propelled shipping year round, due to tidal action which keeps the ice broken throughout the winter season. The port has one other physical problem: the channel must be dredged annually to maintain sufficient depth for ocean-going shipping. Despite the dredging, most larger ships must wait 3 hours into the rising tide before they have sufficient depth to enter the harbor.

Whittier

Whittier is operated principally by the Alaska Railroad and is the point at which railcar barges from Seattle and Prince Rupert, B.C. are loaded and unloaded. In addition, the military maintains a petroleum products terminal at the port, which is connected by an 8-inch pipeline to the Air Force and Army installations in Anchorage. Annual throughput varies between 300,000 and 500,000 tons, with no single commodity being particularly dominant. The railcars arriving at Whittier are usually loaded outside the immediate Seattle area and carry consumer goods not wholesaled in that area and other items such as chemicals, vehicles, machinery, lumber, and metal products which are customarily moved by rail in the continental U.S. and Canada. Alaska destinations are: Anchorage, 60 percent; the Interior, 25 percent; with the remainder going to other areas. Crowley Maritime's Alaska Hydro-Train division presently provides weekly service from Seattle to Whittier using barges with a capacity of 50 to 60 railcars (depending on car length). Frequently, two barges will be towed on each run. Canadian National Railway provides service from Prince Rupert, B.C. every ten days, using a barge with a 20-to-30-car capacity. Washington Tug and Barge provides the actual towing capability for Canadian National Railway.

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[4] **The principal outbound crude terminal is not actually in Kenai but is directly across Cook Inlet at the mouth of Drift River, while the petrochemical port is 7 miles to the north at Nikiski. Within the city itself there is only a small docking facility on the Kenai River.**

Seward

Seward can presently be best characterized as a port in waiting. Before 1964, most of the petroleum and general cargo destined for Anchorage and the Interior moved via the Seward docks. However, most of the port's facilities were destroyed in the 1964 earthquake, and since being rebuilt in 1966 it has primarily been a general cargo port handling about 50,000 to 150,000 tons per year. In early 1979, the last scheduled service, biweekly Pacific Alaska Lines barges from Portland, ceased calling at this port. Since then, the primary activity has been as a shipping point for log and wood chip exports to Japan at the rate of about 40,000 tons annually. Future activity will likely center around the seafood and logging industries and offshore petroleum developments.

The last major movements through the port took place during 1974 through 1977, and were related to pipeline construction and offshore oil exploration. The principal commercial dock at Seward is owned by the Alaska Railroad.

Homer

Of the three lesser ports in the region, Homer is the most important. Its primary function is as a seafood processing center and as a base for an extensive fishing fleet. However, it does not handle large quantities of outbound seafood products. These are generally moved by truck to Anchorage for shipment to Seattle in order to make use of the larger port's more frequent sailings. The largest local export is lumber; the limited amount of logging in the area provides some lumber for shipment to the Far East. The major import tonnages are petroleum products. No scheduled carriers call at Homer.

Cordova

Cordova is the other significant southcentral coast port. It is a fishing port whose principal imports are petroleum products and exports are seafood products. It is the only port in the region without overland transport connections. Service to the town is via fuel barge from Valdez and by Sea-Land's *Aleutian Developer* every two weeks from Kodiak.

Prudhoe Bay

The remaining ocean port in the region is the privately owned facility at Prudhoe Bay. (This arctic coast port is included here with a more southerly region because the economic and overland transport ties of this oil-producing area are with the South-central and Interior areas.) This port is usually open only 4 to 6 weeks per year and in some years may not open at all because of ice conditions. Volume of throughput fluctuates considerably, depending on the types of oil-field development which may be under way at a particular time. Annual volumes have ranged from a high of 187,000 tons during 1970, to 153,000 tons in 1975, down to the present 20 to 40 thousand tons. The present low throughput results from the increasing use being made of the North Slope haul road as a year-round supply facility for the Prudhoe Bay area. Because of the seasonal nature of marine transport, items delivered by water may require storage for up to 12 months. It is this inventory and storage cost which appear to make the haul road an economically feasible alternative. Prudhoe Bay has the only permanent terminal facilities on the northern coast of the state.

Nenana

The one major river port in the Interior is the Nenana, located at the confluence of the Tanana and Nenana rivers and about 200 miles above the point where the Tanana empties into the Yukon. It is a seasonal port, operating from late May through early October of each year. Throughput is usually between 30 and 40 thousand tons, with 99 percent of this being outbound. Of this, about 80 percent is petroleum products, with general subsistence and construction goods making up the remainder. Destinations may include all points on the lower Tanana, Koyukuk, and the Yukon River, all the way from the Canadian border to St. Marys. However, Yukon traffic south of the mouth of the Koyukuk is usually handled via St. Michaels. Nenana is a primary transfer point for supplies to the Air Force stations at Fort Yukon and Galena. The Alaska Railroad owns and operates the port of Nenana. Most barge traffic on the river system is handled by Yutana Barge Lines. The Yukon, Nenana, Tanana, and other major navigable rivers in Alaska are described in Table 4.

Table 4

Major Navigable Alaska Inland Waterways

River	Restrictions
Yukon	Navigable by shallow-draft, flat-bottom river boats from the mouth to near the head of Lake Bennett. It cannot be entered or navigated by ocean-going vessels. Controlling depths are 7 feet to Stevens Village and 3 to 5 feet thereon to Fort Yukon.
Koyukuk	Navigable by vessels drawing up to 3 feet to Allakaket during normally high river flow and to Bettles during occasional higher flows.
Tanana	Navigable by shallow-draft (4-foot), flat-bottom vessels and barges from the mouth to Nenana and by smaller river craft to the Chena River 201 miles above the mouth. Craft of 4-foot draft can navigate to Chena River on high water to University Avenue Bridge in Fairbanks.
Porcupine	Navigable to Old Crow, Yukon Territory, by vessels drawing 3 feet during spring runoff and fall rain floods.
Kuskokwim	Navigable by 18-foot draft ocean-going vessels from mouth upriver 65 miles to Bethel. Shallow-draft (4-foot) vessels can ascend river to Mile 465. McGrath at Mile 400.
Stikine	Navigable (May 1 – Oct. 15) from mouth 165 miles to Telegraph Creek, B.C., by shallow-draft, flat-bottom river boats.
Susitna	Not navigable by ocean-going vessels. Stern wheelers and shallow-draft, flat-bottom riverboats can navigate to confluence of Talkeetna River, 75 miles upstream but cannot cross bars at mouth of river.
Nushagak	The river is navigable by small vessels of 2½-foot draft to Nunachuak about 100 miles above the mouth. Shallow-draft ocean-going vessels can navigate to mouth of Wood River, mile 84.
Noatak	Shallow-draft barges can ascend Noatak River to a point about 18 miles below Noatak village. Shallow-draft vessels can continue on to Noatak.
Kobuk	Controlling channel depth is about 5 feet through Hotham Inlet, 3 feet to Ambler and 2 feet to Kobuk Village, about 210 river miles.
Kvichak	The river is navigable for vessels of 10-foot draft to Alaganak River, 22 miles above the mouth of Kvichak River. Remainder of river (28 miles) navigable by craft drawing 2-4 feet depending on stage of river. Drains Lake Illiamna which is navigable an additional 70 miles.
Naknek	Navigable for vessels of 12-foot draft for 12 miles with adequate tide. Vessels with 3-foot draft can continue an additional 7.5 miles.
Chilkat	Navigable by shallow-draft vessels to village of Klukwan, 25 miles above mouth.

Source: U.S. Army, Corps of Engineers.

The Marine Highway

The state's Marine Highway System operates to the ports of Homer, Seldovia, Seward, Cordova, Valdez, and Whittier and connects these to Kodiak. Service is year-round for all except the Whittier-Valdez route, which is operated only during the summer. Traffic consists almost entirely of passengers and their vehicles, except for occasional freight movements on the Cordova and Homer-Kodiak routes. Frequency is once or twice a week on most links, with three-times weekly service available between Homer and Seldovia and five times weekly between Valdez and Whittier during the summer. Summer schedules require two vessels, *Tustemena* and *Bartlett*. *Tustemena*, the only ocean-going ship in the state's fleet, is assigned to all traffic between the mainland and Kodiak, while *Bartlett* handles business along the coastline. Generally, only one of the ships is operated in winter. Total traffic on this system during 1978 was 47,000 passengers and 13,000 vehicles (Table 5). Comparable figures in 1977 were 40,000 and 13,000. The busiest ports were Valdez, Whittier, and Homer, while the most heavily traveled routes were Valdez-Whittier and Valdez-Cordova.

Roads and Highways

Most points in the Southcentral/Interior region are linked by a system of highways. The network is predominantly two-lane, asphalt-surfaced roads. Exceptions to this include several major gravel highways and some four-lane and freeway-class highways in the immediate vicinity of Anchorage and Fairbanks. Even though roads exist in this region, they do not form a dense network; the entire area of about 175,000 square miles has only seven major highways, five minor ones, and a few access roads. Between the coastal

Table 5

Marine Highway System

1978 Southcentral Passenger Origins and Destinations

Origins

Destinations	Cordova	Ellamar	Valdez	Whittier	Seward	Kodiak	Port Lions	Seldovia	Homer
Cordova		38	2,691	28	1,542	1			
Ellamar	42		14						
Valdez	2,445	10		9,957	711	3			
Whittier	224		11,219						
Seward	1,480		610			1,630	4	7	51
Kodiak	47		30		2,244		237	97	3,158
Pt. Lions					46	227			
Seldovia	1				9	38			2,254
Homer	7		2		48	3,017	95	2,168	

1978 Southcentral Vehicle Origins and Destinations

Origins

Destinations	Cordova	Ellamar	Valdez	Whittier	Seward	Kodiak	Port Lions	Seldovia	Homer
Cordova			1,072	7	303	4			
Ellamar									
Valdez	844			2,043	204				
Whittier	45	30	2,277						
Seward	262		165			637	1		9
Kodiak	14		12		827		95	34	1,209
Pt. Lions					26	99			
Seldovia						38			859
Homer					17	1,200	14	757	

Source: Alaska Marine Highway System; Annual Traffic Volume Report-1978.

areas and Fairbanks, the entire on-highway population does not exceed 10,000. Average daily traffic volume for Alaska highways is shown in Table 6. As can be seen, traffic volumes are not heavy except near urban areas and on the Kenai Peninsula.

The Richardson Highway

The Richardson Highway is the state's oldest road, extending 370 miles from Valdez to Fairbanks. It crosses the coast mountains in the first fifty miles from Valdez, with the remainder of the route traversing rolling hills and high plateaus. Heavily used during construction of the trans-Alaska pipeline, which parallels the road, it has since been only partially reconstructed, with the center segment between Gulkana and Delta Junction being in particularly poor condition. The main commodities carried over the road are petroleum products trucked from Valdez to interior towns and pipeline pump stations and general goods hauled into Valdez from Anchorage and from Fairbanks to Eielson Air Force Base, Fort Greely, and Delta Junction. The highway is four-lane from Fairbanks to Eielson and two-lane the remainder of its length.

Table 6

Average Daily Traffic Volume
Selected Alaska Highway Segments
(Vehicles per day)

Highway Segment	1978	1975	1970	1965	1960
Sterling					
Soldotna-Seward Highway Jct.	2,537	1,723	1,165	690	565
Soldotna-Homer	1,698	1,179	679	440	N/A
Seward					
Seward-Sterling Highway Jct.	768	693	550	429	N/A
Girdwood-Sterling Highway Jct.	1,719	1,594	924	499	N/A
Potter-Girdwood	3,508	2,985	1,929	1,217	889
in South Anchorage	37,791	27,649	16,094	12,907	7,267
Parks					
Glenn Highway Jct.-Willow	1,158	943	381	150	N/A
Willow-Mt. McKinley Park	468	516	–	–	–
Mt. McKinley Park-Nenana	991	791	–	–	–
Nenana-Fairbanks	820	1,136	364	260	N/A
Glenn					
Anchorage-Eagle River	17,566	11,373	7,150	4,105	2,982
Eagle River-Palmer	7,910	5,351	3,322	1,964	N/A
Palmer-Glennallen	501	607	N/A	N/A	N/A
Tok Cut-off, Alaska					
Tok-Canadian Border	235	292	176	208	N/A
Glennallen-Tok	497	451	333	258	N/A
Richardson					
Valdez-Glennallen	275	696	164	101	N/A
Gulkana-Delta Junction	207	552	367	269	N/A
Delta Junction-Eielson AFB	730	643	575	550	N/A
Eielson AFB-Fairbanks	11,022	10,150	5,647	4,695	4,419
Other					
Palmer-Wasilla	2,233	1,736	1,249	1,425	1,197
Ketchikan-Ward's Cove	4,231	N/A	N/A	1,979	N/A
Haines-Canadian Border	632	603	613	330	N/A
Fairbanks-Fox	1,769	2,753	1,433	886	489
Juneau-Auke Bay	12,771	9,538	6,146	4,262	2,224

Source: Alaska Department of Transportation and Public Facilities; Alaska Highways Annual Traffic Volume Report-1978.

The Alaska Highway

Alaska's principal overland connection to Canada and the United States is the Alaska Highway. Built as an emergency measure in World War II, the road extends southeastward 200 miles from its connection with the Richardson Highway at Delta Junction to the Canadian border. From that point, it reaches 1,200 miles through Whitehorse to its connection with the Canadian transcontinental system at Dawson Creek. Two hundred miles east of the Alaska-Yukon border, at Haines Junction, the Alaska Highway connects with the highway that originates at Haines, Alaska in the Southeast. Freight traffic on the Alaska Highway enjoyed a brief boom during the 1975-1977 pipeline construction years, with about 40,000 tons of general cargo coming into the state in 1977. However, since that period, freight movements have decreased to much lower levels, reflecting that little more than local supplies, mail, and a few household goods are being moved. Passenger (principally tourist) traffic continued its steady postwar increase until 1979, when it slackened due to gasoline shortages in the U.S. Tourist use now represents the most important use of the facility. The Alaska portion of the highway is paved, as are several hundred miles in Canada in segments near Whitehorse, Watson Lake, Fort Nelson, and Dawson Creek. However, most of the Canadian route remains gravel. The entire 1,400-mile route is through rolling hill country.

The Glenn Highway

Connecting Anchorage to the Richardson and Alaska highways is the Glenn Highway, which extends 325 miles from Tok on the Alaska Highway through Glennallen on the Richardson Highway to the Matanuska-Susitna Valley and Anchorage. Freight traffic on the route includes petroleum products from Anchorage destined for points along the Glenn, Richardson, and Alaska highways and general goods destined for Valdez and areas of the eastern interior. The first 20 miles east of Anchorage are four lane, while the remaining 20 miles to Palmer are two lane, all through flat coastal terrain. East of Palmer the next 75 miles traverse mountainous areas, while the remaining segments to Glennallen and Tok are across the rolling interior plateau.

The Parks Highway

The remaining major road of the Interior system is also the newest and most heavily used. This is the Parks Highway which provides direct road access from the south (near Anchorage) to Fairbanks. It is 325 miles from its junction with the Glenn Highway near Palmer to the northern interior city. Important intermediate points include several towns in the Lower Susitna Valley, the Healy River coal mining area, Mt. McKinley National Park, and the river port of Nenana. Commodities moved are in all classes, including about 75,000 tons for local delivery along the highway and about 150,000 tons of items bound for Fairbanks and points north. This highway has also become a principal artery for passenger travel within the state. Most of the route is through rolling country, although some stretches are mountainous. The entire highway is two lane.

The Seward and Sterling Highways

South of Anchorage, two highways, the Seward and the Sterling, serve most significant communities on the Kenai Peninsula. The Seward Highway goes south for 125 miles from Anchorage to Seward. Its principal freight use is for transporting consumer goods from Anchorage to Seward and for moving seafood products northward for forwarding through the Anchorage port. Most of the route is across mountainous terrain while all but the 8 miles closest to Anchorage is two lane. The Sterling Highway extends from its origin at mile 39 of the Seward Highway 135 miles west and south to the cities of Soldotna and Homer, with a major spur to the petrochemical and fish processing area around the Kenai. This is one of the most heavily used highways in the state. Total commodity traffic is estimated at about 225,000 tons annually, comprised mostly of inbound consumer goods and outbound processed seafood from Homer and Kenai. In addition, there are significant movements of petroleum products throughout the area and logs along the Homer-Kenai segment. The highway is two lanes throughout its length, and except for the easternmost 20 miles, is through rolling country. Passenger traffic is heavy on all Kenai Peninsula highways, particularly weekend recreational traffic from Anchorage.

The Prudhoe Bay Highway

The Prudhoe Bay Highway is the last major artery in this region. It is actually composed of two roads, the first being the southernmost 75 miles of the Elliot Highway, north of Fairbanks (from Fox to Livengood), with the remainder being the 420-mile North Slope Haul Road constructed by Alyeska Pipeline Service Company during the building of the trans-Alaska pipeline. The highway is open to public use as far north as the Yukon River, with access restricted beyond that point to firms with special state permits. The highway is mostly used by North Slope oil producers or companies supplying goods for their consumption. Current freight traffic is almost entirely northbound and is mainly heavy oil field supplies. Both segments of the road are gravel except for about 20 miles of pavement on the Elliot Highway near Fairbanks.

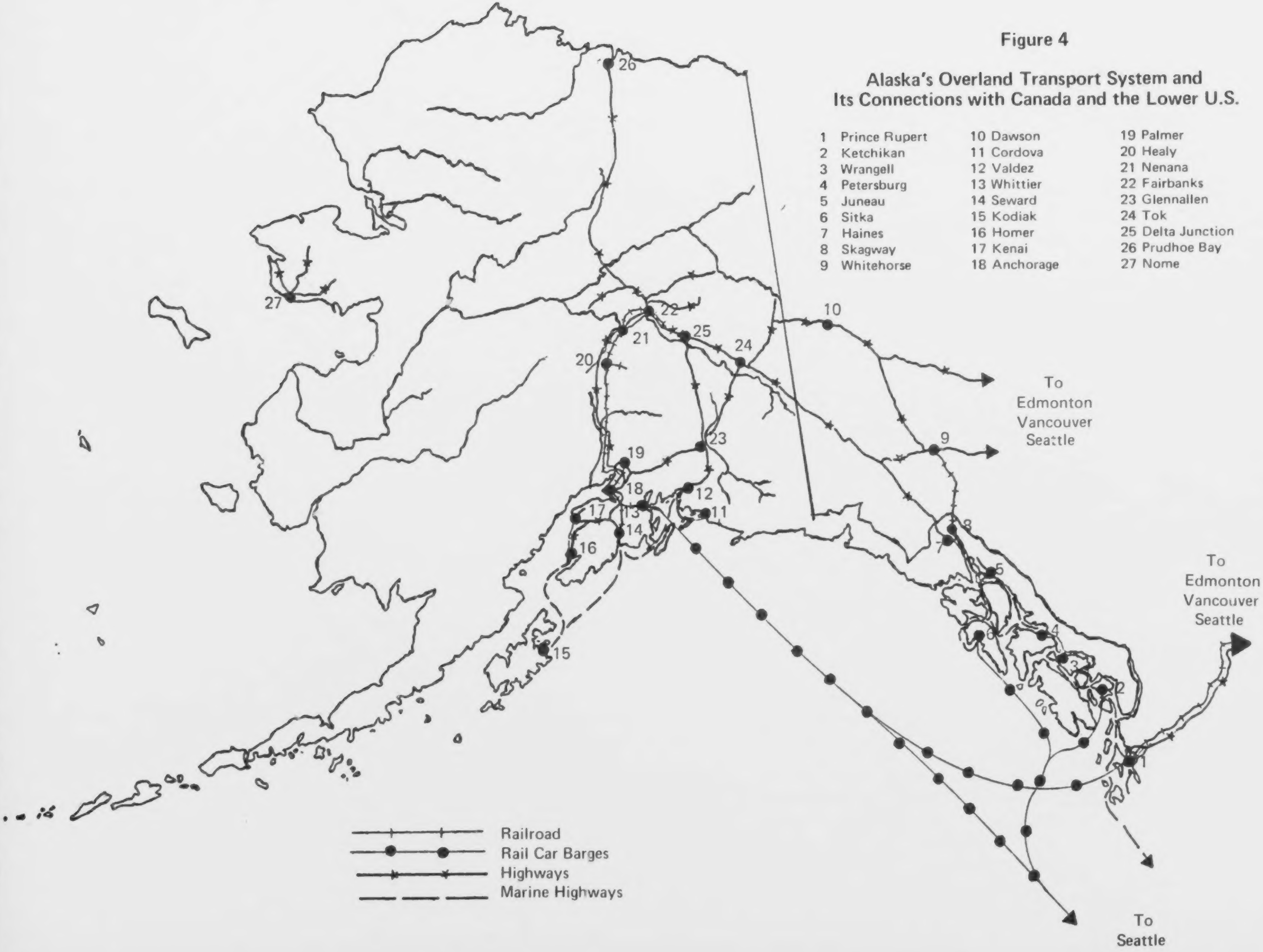


Figure 4

Alaska's Overland Transport System and Its Connections with Canada and the Lower U.S.

1 Prince Rupert
2 Ketchikan
3 Wrangell
4 Petersburg
5 Juneau
6 Sitka
7 Haines
8 Skagway
9 Whitehorse
10 Dawson
11 Cordova
12 Valdez
13 Whittier
14 Seward
15 Kodiak
16 Homer
17 Kenai
18 Anchorage
19 Palmer
20 Healy
21 Nenana
22 Fairbanks
23 Glennallen
24 Tok
25 Delta Junction
26 Prudhoe Bay
27 Nome
To Edmonton Vancouver Seattle
To Edmonton Vancouver Seattle
To Seattle
Railroad
Rail Car Barges
Highways
Marine Highways

Principal Secondary Roads

The principal secondary roads in the region primarily serve local community requirements or provide recreational access. All five of those mentioned here are maintained only during the summer:

- The Steese Highway provides access from Fairbanks to Circle on the Upper Yukon River, 160 miles westward from the river's junction with the Prudhoe Bay Highway.
- The Elliot Highway is a 156-mile gravel road that extends from the Steese Highway (at Fox) to Livengood and Manley Hot Springs on the Lower Tolovana River.
- The Taylor Highway runs from the Alaska Highway at Tetlin Junction, twelve miles east of Tok, for 160 miles to Eagle on the Upper Yukon near the Canadian border. Fifty miles south of the river it forms a junction with the Canadian Klondike Highway to Dawson and Whitehorse.
- The Denali Highway is 160 miles long and provides access to Mt. McKinley National Park from the Richardson Highway at Paxson.
- The Edgerton Highway extends 95 miles from the Richardson Highway near Tonsina to McCarthy in the Wrangell Mountains.

Motor Transport Carriers

There are about 200 motor transport common carriers in the state, of which about twenty-five to thirty usually have annual operating revenues of $1 million dollars or more. Of these, about one-third are operated by household goods moving and storage companies. Of the remaining operators, the most important are Lynden Transport, Sea-Land Freight Service, Mukluk Freight Lines, K&W Trucking, Mammoth, Sourdough Express, KAPS Transport, and Kodiak Oil Field Haulers. The remaining large common carriers generally provide local delivery services of one product exclusively (usually bulk petroleum). The small common carriers are mainly towing and wrecking firms and local delivery services. In addition, there are almost 200 contract motor carriers in Alaska, only about five of whom have over $1 million dollars operating revenue annually. About 85 percent of the contract carriers are limited to hauling of dry bulk construction goods (sand, gravel, cement) usually as part of a parent construction company. Of the remainder, about one-third are log carriers, half are house movers, and the rest haul mostly petroleum products or general cargo. In addition to the freight carriers, there are about thirty-five firms licensed to carry passengers. Of these, about half are taxi or limousine services and most of the remainder operate only charter, tour, or sightseeing services. Only three provide scheduled intercity routes.

The Alaska Railroad

The Alaska Railroad is the state's principal rail facility, extending 470 miles north from the ports of Seward and Whittier, through Anchorage, Healy, and Nenana to Fairbanks. Owned and operated by the U.S. Department of Transportation, it has a single main track throughout and is operated without a train control signal system. Although traffic volumes are not heavy (see Table 7), the physical plant is well maintained and is capable of handling all types of equipment between Whittier and Anchorage, as well as cars up to 90 tons capacity elsewhere. A major upgrading of track and structures during the 1975-1977 period accounts for the current excellent condition. The purchase of fifteen new locomotives together with the rebuilding of ten others has also given the line a reliable, modern motive power fleet. Annual traffic volume varies between 1.8 and 2.3 million tons, with 75 percent of this consisting of gravel and coal. Gravel, moved to Anchorage from Palmer in summer-operated unit trains, accounts for about half of the total volume, while coal movements from Healy to Fairbanks and Eielson Air Force Base equal 500,000 to 600,000 tons. Movement of petroleum products, mostly gasoline, from Anchorage to Fairbanks amounts to 200,000 tons, while Anchorage-to-Fairbanks container and trailer traffic reaches 100,000 tons a year. The remainder is accounted for primarily by interline movements received via the rail car barges at Whittier (about 220,000 tons) and by cement transported from Anchorage to Fairbanks. Frequency of freight service is three times weekly between Anchorage and Fairbanks, with overnight delivery to Fairbanks of goods arriving in Anchorage by ship. Twice weekly coal trains operate from Healy to Fairbanks; service is once or twice weekly from Anchorage to meet barges in Whittier, once weekly to Seward, mostly for log movements, and five or six times weekly for summer gravel trains from Palmer to Anchorage. The railroad also delivers fuel to both Anchorage and Fairbanks international airports. Daily Anchorage-Fairbanks and Anchorage-Whittier passenger service is provided during the summer with the schedules being reduced to twice and three times weekly, respectively, in the winter. The summer trains to Whittier provide an auto shuttle service to connect with the Marine Highway vessels to Valdez, while the winter passenger trains to Fairbanks also handle high-priority container and trailer traffic. The principal yard, repairshops, and headquarters are located in Anchorage, while other smaller yards and shops are at Seward, Healy, Fairbanks, Whittier, Palmer, Suntrana, Nenana, and at the four military installations served by the railroad.

Table 7

Alaska Railroad Traffic Profile

Freight Traffic Revenue Tons
(in Thousands)

Commodity	1971	1972	1973	1974	1975	1976	1977	1978	1979
Sand and Gravel	3	3	2	1	1	104	700	727	637
Coal	600	607	565	563	584	607	550	593	524
Bulk Petroleum	248	406	363	414	557	624	532	374	220
TOFC/COFC (Piggyback)	49	35	48	57	95	114	100	100	89
Forest Products	43	51	49	56	120	124	82	68	55
Machinery and Machines	16	16	15	21	60	31	47	47	24
Cement	16	12	15	14	25	32	42	33	33
Iron and Steel Pipe and Fittings	29	68	11	15	107	174	16	28	33
Manufactured and Misc. Products not otherwise specified	32	43	32	34	44	29	17	13	25
Manufactured Iron and Steel	20	21	18	37	60	89	19	12	12
Agricultural Products	11	22	18	15	13	9	12	8	7
Animal Products	6	19	8	5	3	3	4	2	0
Other	148	303	187	145	193	248	184	173	149
TOTAL	1,221	1,606	1,331	1,377	1,862	2,188	2,305	2,178	1,808

Revenue Passengers
(in Thousands)

	1971	1972	1973	1974	1975	1976	1977	1978	1979
Passengers	94	102	74	85	81	84	118	126	151

Note: All quantities are for federal fiscal rather than calendar years.

Source: Alaska Railroad, Office of Policy and Plans.

Air

Air service in the region is comprehensive. Most passenger traffic moves by air, although because of highway and rail alternatives, it is not as dominant as in the other regions. Areas with scheduled jet services include Anchorage, Fairbanks, Prudhoe Bay, Kenai, Homer, and Cordova, with those at Anchorage and Fairbanks being international class facilities around which most service in the region revolves.

International Air Service

Anchorage is the hub not only of the region and the state, but also of the Northern Pacific Rim. It has direct passenger and freight flights to most of the major hubs of Western Europe and Southeast Asia in addition to frequent service to U.S. points and Alaska locations. Northwest Orient, Flying Tiger, Japan Air Lines, Lufthansa, British Airways, Sabena, KLM Royal Dutch, and Scandinavian Airlines all provide passenger or cargo service from Anchorage to Japan and other Far East points while all but the first two also fly from Anchorage to Europe.

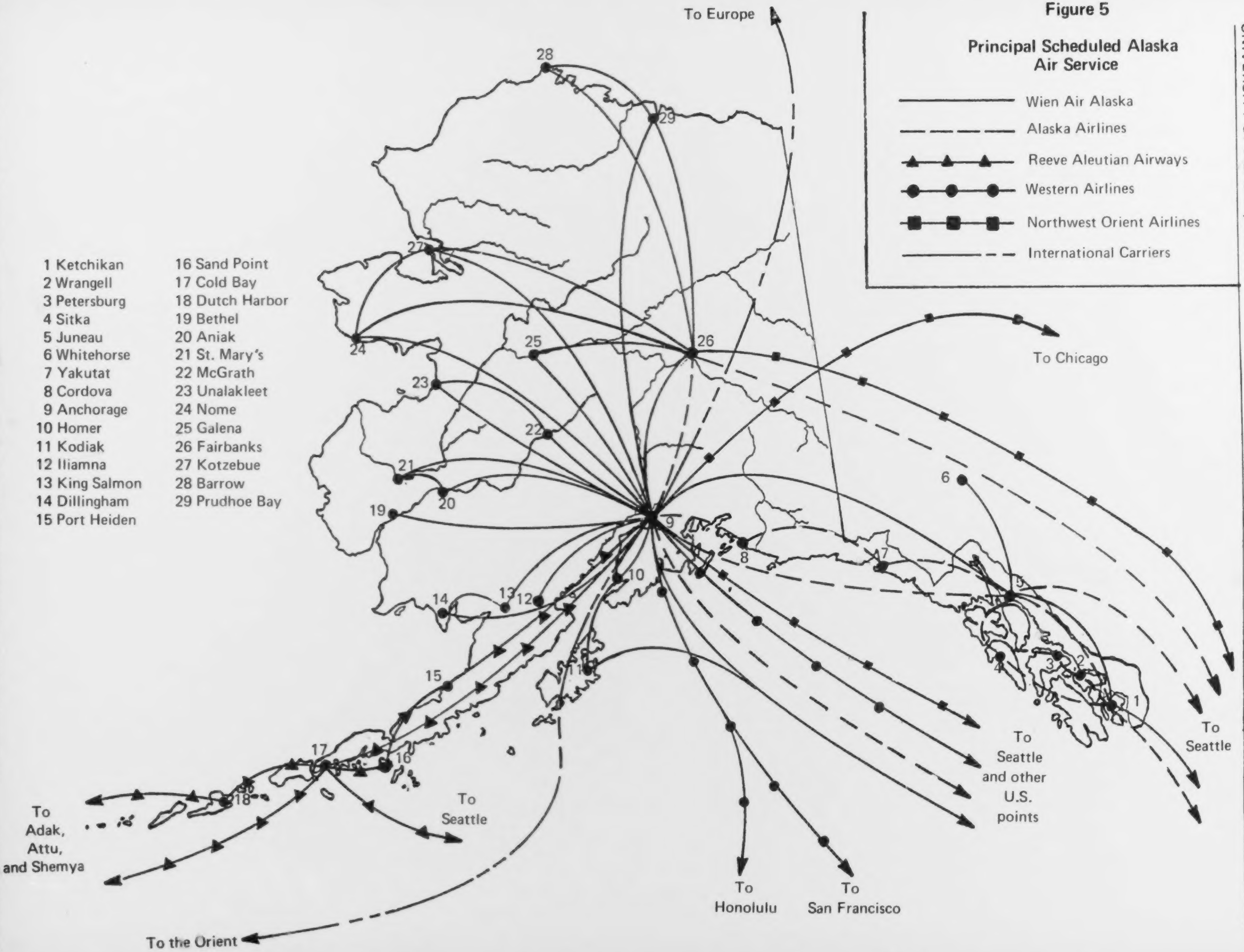
Interstate Air Service

Interstate service from Anchorage is provided by Alaska Airlines, Wien Air Alaska, Western Airlines, Flying Tiger, and Northwest Orient Airlines as follows:

- Alaska Airlines provides four to six daily flights to Seattle (two of which continue to San Francisco), one to Portland, and one to Dallas and Houston on a through-plane agreement with Braniff.
- Wien provides two or three daily flights from Anchorage to Seattle, and during the summer, three weekly flights from Kenai to Seattle
- Western Airlines also flies between Anchorage and Seattle four to six times daily, with four flights continuing to either San Francisco, Los Angeles, San Diego, Phoenix, Denver, Dallas, Houston, or New Orleans, with the latter four cities served via a through-plane agreement with Continental Airlines. Western also has daily direct service to San Francisco and three to six weekly flights to Honolulu.
- Northwest Orient has two or three daily flights to Seattle, with continuing service to Los Angeles, Tampa, Chicago, Cleveland, and

Figure 5

Principal Scheduled Alaska Air Service


Wien Air Alaska
Alaska Airlines
Reeve Aleutian Airways
Western Airlines
Northwest Orient Airlines
International Carriers
To Europe
To Chicago
To Seattle
To Seattle and other U.S. points
To Honolulu
To San Francisco
To Seattle
To Adak, Attu, and Shemya
To the Orient
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1 Ketchikan
2 Wrangell
3 Petersburg
4 Sitka
5 Juneau
6 Whitehorse
7 Yakutat
8 Cordova
9 Anchorage
10 Homer
11 Kodiak
12 Iliamna
13 King Salmon
14 Dillingham
15 Port Heiden
16 Sand Point
17 Cold Bay
18 Dutch Harbor
19 Bethel
20 Aniak
21 St. Mary's
22 McGrath
23 Unalakleet
24 Nome
25 Galena
26 Fairbanks
27 Kotzebue
28 Barrow
29 Prudhoe Bay

Atlanta. Direct daily Anchorage-to-Chicago service is also offered with this flight continuing to Miami.

- Flying Tiger also provides direct daily cargo service to New York, Chicago, Seattle, and Los Angeles.

Aircraft used by companies on these routes include the Boeing 720, 727, 737, 747, and McDonnell-Douglas DC8s and DC10s.

Intra-regional Air Service

Much of the inter-regional service linking Anchorage with other regions of the state has been previously mentioned. However, there is also considerable air transport activity within the Southcentral/Interior area. The two largest carriers are Alaska Airlines and Wien Air Alaska. Alaska flies to Cordova once daily and to Fairbanks five times daily. Wien flies to Fairbanks four or five times daily. Two or three of these flights continue to Barrow and Prudhoe Bay, while direct Anchorage-to-Prudhoe Bay service is offered several days a week. Twice weekly service to Homer is available.

Anchorage is also the center of considerable intra-regional commuter operations, with the two largest firms being Alaska Aeronautical Industries (AAI) and Polar Airlines. AAI offers 145 to 250 flights per week between Anchorage and Kenai and 45 to 60 scheduled weekly flights to Homer. Service is also available to Seward, Cordova, and Valdez. Polar has 35 to 50 flights weekly to Kenai and 25 to 35 flights weekly to Valdez. Also available is a weekly service to Glennallen, Tok, and Delta Junction. Total traffic at Anchorage is shown in Table 8 for 1977 and 1978.

Fairbanks also has both international and domestic traffic, although not to the levels of Anchorage. However, the recent availability of locally refined jet fuel has made Fairbanks increasingly attractive to international cargo flights. In addition to service to Seattle via Anchorage on Alaska Airlines, Fairbanks also has daily direct flights to Seattle continuing to San Francisco on both Northwest Orient and Alaska. As mentioned earlier, it also has direct service to many locations in northern and western Alaska. In particular, Wien serves Prudhoe Bay from Fairbanks twice daily. Fairbanks also serves as a staging area for the transport of high-value goods to the North Slope, after they have been brought to this interior city by a variety of modes. Alaska International Airlines, using the Lockheed Hercules, is the largest carrier in this market.

THE ALASKA PETROLEUM DISTRIBUTION SYSTEM

Clearly, much of the total state demand for transport results from the need to move a wide variety of petroleum products. For this reason and due to the critical nature of this commodity for most communities, petroleum products distribution deserves a somewhat detailed treatment here. The subject is also of particular interest because petroleum products produced in Alaska represent a significant

Table 8

Anchorage International Airport Traffic

	Passengers Inbound (in thousands)		Passengers Outbound (in thousands)		Passengers in Transit (in thousands)		Total Passengers (in thousands)	
	1977	1978	1977	1978	1977	1978	1977	1978
International	31.8	30.5	32.0	28.9	880.4	988.7	944.2	1,048.1
Domestic	572.3	579.7	590.3	597.2	86.0	76.8	1,248.6	1,253.7
Intrastate	340.7	372.1	343.2	375.7	1.5	0.2	685.4	748.0
Total	944.8	982.3	965.5	1,001.8	967.9	1,065.7	2,878.2	3,049.8

	Cargo Inbound (tons)		Cargo Outbound (tons)		Total Cargo (tons)	
	1977	1978	1977	1978	1977	1978
International	492.1	484.7	1,272.2	2,116.4	1,764.3	2,601.1
Domestic	32,807.7	30,474.4	12,263.9	10,302.9	45,071.6	40,777.3
Intrastate	16,158.7	21,227.1	69,202.9	65,413.5	85,361.6	86,530.6
Total	49,458.5	52,076.2	82,739.0	77,832.8	132,197.5	129,909.0

part of the intrastate as well as interstate and foreign commerce. Six oil companies are involved in this distribution system and they employ both in-house transport resources and those of common and contract carriers. This section will detail the operations of each of these companies.

Chevron, U.S.A.

The most extensive operations in Alaska are those of Chevron. The company operates four principal distribution centers and has other smaller facilities at numerous locations throughout the state. The principal bulk plant for the Southeast is in Ketchikan. It is mainly supplied by company-operated tankers from California refineries and by contract barge from a Puget Sound refinery. Some products are also supplied from Chevron's small refinery in Nikiski. From Ketchikan, products are moved to points throughout the Southeast by contract fuel barges. The major smaller bulk plants are located in Wrangell, Petersburg, Juneau, Sitka, Haines, and Skagway. Chevron's current contractor in the Southeast is Foss Launch and Tug.

Unalaska is the center for operations in the Western-Arctic region. Chevron is the only firm conducting business in this part of the state. The Unalaska terminal receives products from California refineries by tanker. These are then moved to points north and west in contract fuel barges. Local bulk plants are located at Naknek, Dillingham, Bethel, St. Michael, Nome, and Kotzebue. The facility at St. Michael is used mostly as a point for transfer from ocean to river barges. In addition to serving significant local markets, the operations at Bethel and Kotzebue are also transshipment points for distribution to Kuskokwim and Kobuk River locations, respectively. The mainline barge contractor for Chevron in this region is Crowley Maritime, while the Yukon River traffic is handled by Black Navigation. Distribution on the Kuskokwim River is through the services of United Transportation. Seasonal constraints require that all annual petroleum requirements of this region, except those of Unalaska and the Aleutians, be imported between May and October.

The third Chevron distribution point is in Valdez. Products are transported to this location by barge from Kenai and Puget Sound refineries and by company-owned tankers from California refineries. From Valdez, deliveries are made to smaller bulk plants in Yakutat, Cordova, Seward, Homer, Kodiak, and to various fishing stations along the southerly side of the Alaska Peninsula. The Valdez distribution center also supplies Southeast Alaska, particularly Juneau, with Kenai-processed fuel. The method used for many of the local marine deliveries is rather unique. Chevron uses a 2,700-ton tanker, *Alaska Standard*, for service to the outlying ports. The small size of this vessel both gives it the capability of calling at many points having only limited facilities and closely matches it to the product demand and storage capabilities of these locations. In addition to the marine distribution, products are also moved from the Valdez plant by highway to points in the Interior, generally only as far north as Glennallen or Gulkana but occasionally to more distant locations.

Of the four principal plants, the Anchorage distribution terminal moves the largest volume of products. It is the principal supply location for both local needs and those of the Interior. Products arrive at the Anchorage terminal from two principal sources. The first is by company tanker from California refineries, while the second is by pipeline from the Nikiski refineries. From Anchorage, truck transport supplies local area needs and those of local points along the Glenn Highway, the Parks Highway south of Nenana, the Richardson Highway between Glennallen and Delta Junction, and some areas of the Kenai Peninsula. Other points on the Peninsula are supplied by truck directly from the Nikiski terminal.

Rail transport is used for petroleum products going to the Nenana and Fairbanks bulk plants. These plants also receive products from the Earth Resources Refinery in North Pole. From Fairbanks, distribution is made by highway to northern Interior points, while Nenana is used primarily as a rail-barge interchange point for products destined for towns along the upper Yukon and lower Tanana rivers. This service is provided by Yutana Barge Lines.

Union Oil Company of California

The Union Oil Company maintains the second largest distribution network in the state. It has a somewhat more limited area of operations than Chevron and the structure of its system differs to some extent. It serves both the Southeast and Southcentral/Interior regions.

The Southeast is served from the West Coast refineries by two large terminals located at Juneau and Ketchikan. The Juneau facility provides products only for local consumption. The Ketchikan facility, however, fulfills a much broader role, distributing its products via contract barge to smaller bulk plants throughout the Southeast. Locations of these plants are at Metlakatla, Noyes, Hoonah, Chatham, Petersburg, Wrangell, Sitka, Tenakee, and Haines. Union also provides considerable quantities of fuel to logging camps throughout the region. The present barge contractor for this system is Foss Launch and Tug.

Further west, Union has a somewhat more complex system, with major terminals in Kodiak, Anchorage, and Fairbanks. Kodiak receives products both from the company's West Coast refineries and from the Tesoro Refinery in Nikiski. Service from the West Coast is by company-owned tanker, while the intrastate distribution is by a local barge contractor. The Kodiak terminal supplies products for local consumption only.

The largest of Union's Alaska facilities is at Anchorage. Most of its products are received by pipeline from the Tesoro Refinery in Nikiski; however, aviation fuel and asphalt feedstock are brought from the West Coast by company-owned tankers. The latter material is refined into commercial asphalt in the firm's Anchorage plant. From the Anchorage terminal, products are distributed by highway both to the local area and to smaller bulk plants in Palmer, Talkeetna, Glennallen, Tok, and to some points on the Kenai Peninsula. The peninsula is also served by highway direct from Nikiski for some products. From Anchorage, some products, principally gasoline and aviation fuel, move by truck or rail to Healy and Nenana and by rail to Fairbanks.

The main terminal in the Interior is at Fairbanks. As mentioned, it receives some products from Anchorage while the remainder, mostly diesel and heating oil, are purchased from the refinery at North Pole. These items are then distributed throughout the Interior by both highway and rail to the Nenana and Healy facilities.

Texaco

Texaco has only a single major distribution point in the state, at Anchorage, which receives products by company tankers from their West Coast refineries and by pipeline from Tesoro's Nikiski Refinery. From Anchorage, products are moved by rail to both Fairbanks and Seward and by highway to all points on the Glenn and Alaska highways, the Parks Highway south of Nenana, and the Richardson Highway south of Delta Junction. The western portion of the Kenai Peninsula is served by highway from a small terminal in Nikiski.

Tesoro-Alaska

Tesoro has extensive facilities throughout the Southcentral-Interior region. The basic component in its operation is its refinery in Nikiski and its ten-inch pipeline from there to Anchorage. As noted previously, these facilities provide service to a number of companies besides Tesoro. However, their primary function is to ensure adequate supplies for the company's own operations. Tesoro maintains three major terminals in the state, at Anchorage, Valdez, and Fairbanks.

The Valdez facility receives products by contract barge from the Nikiski refinery. From this point they are distributed by truck to southern Interior highway points.

The Anchorage terminal receives products by pipeline from Nikiski. These are then distributed by highway to the local area and to points on the western Glenn and southern Parks highways and by rail to the Fairbanks terminal. From Fairbanks, distribution to the northern Interior takes place via highway transport. The Kenai Peninsula is served by highway directly from the Nikiski terminal.

Other Systems

Three other operations distribute petroleum in the state. The first of these, Mobil Oil Company, has a bulk terminal in Ketchikan from which it distributes products to logging camps in the southern part of the southeast region. The second, Shell Oil, maintains a terminal in Anchorage that primarily supplies aviation and jet fuel for several airlines operating from Anchorage International Airport. This facility receives most of its products from refineries in Singapore.

The third and most extensive system is that maintained by the Department of Defense to service its operations in the state. The Military Sealift Command provides in-house and charter tanker service to its principal terminals in the state (Whittier, Unalaska, Kodiak) while making extensive use of charter fuel barges to serve more remote locations. Currently, Crowley Maritime provides this service. The Whittier terminal is connected to an Anchorage terminal by an eight-inch pipeline. From there, gasoline and aviation fuel is shipped by rail to Fort Wainwright and Eielson Air Force Base. From Ft. Wainwright it is shipped by highway to Ft. Greely. The military purchases diesel and jet fuel for these installations from North Pole Refinery when it is available. Yutana Barge Lines also provides petroleum transport capability between Nenana and Galena and Ft. Yukon Air Force stations. The military also has a terminal with tanker facilities in Haines and an inland terminal at Tok. These are connected to each other and to Ft. Wainwright by an eight-inch pipeline. However, because of pipeline deterioration, this system is now out of service.

General Observations

Petroleum-Products Transport

The transport equipment used in the Alaska market consists of mostly smaller units tailored to the limited demands of the market. Other than the *Alaska Standard* mentioned earlier, tankers are in the range of 15,000 to 50,000 tons. Representative of these are *Chevron Washington*, 40,000 tons, and Union Oil's *Lompoc*, 17,000 tons, both of which visit Alaska frequently. Ocean-going fuel barges are predominantly of a size similar to the Foss Launch and Tug 286 class with a capacity of 38,000 barrels (5,300 tons), although Crowley does have one of its largest barges converted to fuel service with a capacity of 105,000 barrels (14,500 tons). Smaller units are used in Western Alaska for lighterage to shore as well as for river movement. These are usually in the range of 2,200 to 3,600 barrels (300 to 500 tons). Highway and rail equipment used in Alaska is similar to that used throughout North America.

Major Events Impacting the System

Over the past two decades, certain events have had considerable impact on the shape of the petroleum products distribution system. The first of these was the 1964 earthquake. Prior to that time, Chevron and Texaco had their principal import terminal facilities located in Seward, while Union's main base was in Whittier. The destruction of all of these facilities[5] occurred shortly after the installation of petroleum transfer capability at the Anchorage port, which was not harmed by the earthquake. This resulted in the main operations for all three companies being shifted to Anchorage. These facility shifts simply represented a reorientation of the external supply system to changes in Alaska geographic conditions.

The second event (or combination of events) is more recent and is in fact still evolving. These consist of the production startup of the Earth Resources Refinery at North Pole, the Tesoro Refinery at Nikiski, and the connection of the latter by pipeline to Anchorage. These developments are much more profound in their long-term impact than the immediate destructive results of the earthquake. This is particularly true in the area of transportation, where the changes formed the basis for an intrastate petroleum production and distribution system. While the effect has been greatest in the railbelt area, all parts of the state have been influenced to some degree. Most locations in the state are now using at least some Alaska fuel. These trends toward self-sufficiency received considerable encouragement from summer fuel shortages on the U.S. West Coast and can be expected to accelerate if recently announced plans for expansion of the Tesoro refinery and construction of the Alaska Petrochemical Refinery at Valdez are carried through. Even without these developments, an increasing proportion of all fuel consumed in the state will be locally produced.

CONCLUSIONS

In this discussion, we have viewed the state's transport system on a regional basis. Within each of these areas, intra-regional trade and movements to points outside the state are more important than interactions with the other regions. Often, only the most basic inter-regional ties exist. Several overall characteristics of the system are immediately obvious and carry important implications for future transportation planning. These include the dominance of marine transport, the economic-transportation system interactions, the sparseness of Alaska's transportation network, and the various types of flow imbalances.

With only three major exceptions (rail haulage of coal and gravel and Nikiski-Anchorage pipeline movements), all significant commodity flows in the state have a marine component. Because so much of Alaska's activity is coastal, the marine element may be the only transport activity involved in the shipment, other than local delivery. This situation indicates the importance of analysing the structure of maritime operations, port systems, and the method of integrating inland transport into the marine system. It has generally been port location and technology that have controlled the transport component of resource production and the characteristics of the logistics systems developed to satisfy consumer goods demand.

The interaction of transport with its economic environment is another clear characteristic of the Alaska system. The evidence provided by the state's development history indicates that successful transport endeavors have followed the creation of an economic demand (mining, petroleum, timber, defense, fisheries, and Government service delivery). Thus, real or potential economic activities which have required transport services have also caused the development of facilities and operations to satisfy their demands. Examples of this might include the Kenai Peninsula Highway System that was developed in response to petroleum, fisheries, and recreational demand; the Port of Anchorage, which was developed in response to consumer demand; and the port of Kodiak, which was developed in response to requirements of the fishing industry.

Facilities that were constructed without regard to economic demand have met with little success. Examples of the latter include the reconstruction of the Seward Port following the 1964 earthquake and the Interior highway system. In neither case has the construction of transport facilities, without prior economic demand, been sufficient to cause subsequent economic activity, even though both are located in areas of considerable resource potential.

This is not to say that a transport facility, once it is in place, does not contribute to the development of secondary economic activity. This has occurred several times, including the Healy River coal fields, Matanuska Valley gravel mining and Anchorage wholesaling activity. However, each of these activities, which were partially made economically attractive by the existance of transport capability, were also insufficient by themselves to support the initial capital investment required by the transportation facility. Effectively, these economic developments were also responding to the same economic stimuli which created the transport system. Thus, it appears that the Alaska situation requires the existance of a potential or actual economic development before transport development.

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[5] Including Seward's inland rail connection.

The sparseness of the network even in relatively developed regions makes it obvious that any facility additions or changes or any flow pattern or volume changes may impact major portions of the system. This is particularly true if such a change were to lead to a substantial flow across regional boundaries. The relatively small traffic volumes and primitive facilities make the term "major change" refer to projects or commodity quantities which would be regarded as incremental improvements or flow diversions in more highly developed parts of the nation. Thus, a systemwide model that takes the whole network into account would likely be the most appropriate tool for assisting the planning and decision-making process in the transport sector.

Another characteristic that has determined the state's pattern of transport development is the flow imbalance which results in low back-haul rates. Even though the state's imports and exports are somewhat balanced in terms of total quantities, the mix of commodity types (export of bulk resource materials versus imports of manufactured goods and food) is such that one type of vehicle cannot be used for both export and import. In any case, the import commodity flows have to be broken down into relatively small shipment sizes because of the small markets and long distances. This has prevented the development of a modern efficient transport infrastructure in most areas. In most of the state, only the most rudimentary cargo handling facilities are available due to the limited volumes which are being moved. This severely limits the types of of vehicles that can be used in a particular service, a problem made even more serious by the limited number of transport modes available.

In this article we have outlined the structure and constraints of the Alaska transport system. Subsequent *Reviews* will define the procedure designed to replicate and simulate this system in a computer model and detail findings regarding the interrelationship of transportation and various kinds of development.

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